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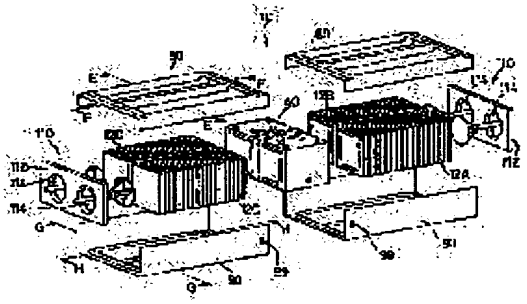
(54) FUEL CELL

(57)Abstract:
PURPOSE: To let fuel and the like uniformly flow in respective laminated bodies, facilitate its installation, and make the fuel cell small in size in the fuel cell equipped with a plurality of the laminated bodies.
CONSTITUTION: The fuel cell 10 is made up of laminated bodies 12A through 12D where suction and exhaust passages for fuel and the like are formed in the direction of lamination, a suction and exhaust member 40 for fuel and the like, which supplies with and empties of fuel and the like for the laminated bodies 12A through 12D out of holding surfaces held by the laminated bodies 12A through 12D, an upper case 80 and a lower case 90 which form a housing container for the laminated bodies 12A through 12D, and of a pressing mechanism 110 pressing the laminated bodies 12A through 12D in the direction of lamination. The suction and exhaust passages to the respective laminated bodies 12A through 12D in the suction and exhaust member 40 for fuel and like, are formed in an identical shape. This constitution thereby enable fuel and the like to uniformly flow into the respective laminated bodies 12A through 12D. Besides, it is good enough that the suction and exhaust member 40 for fuel and the like is only connected with a fuel suction and exhaust means and the like, installation is thereby facilitated, and the fuel cell can be made small in size.



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CLAIMS

[Claim(s)]
[Claim 1] The fuel cell equipped with the fuel feeding-and-discarding member which prepared the hole which is the fuel cell equipped with two or more layered products which come to carry out the laminating of the cell, is pinched by said two or more layered products, and performs the feeding and discarding of a fuel system to these two or more layered products at least in the contact section with these two or more layered products.
[Claim 2] The fuel cell according to claim 1 with which the contact section with said fuel feeding-and-discarding member of two or more of said layered products is the laminating edge of this layered product, and these two or more layered products were respectively equipped with the feeding-and-discarding passage of the fuel system of the direction of a laminating.
[Claim 3] The fuel cell [equipped with the holddown member which fixes said fuel feeding-and-discarding member and said layered product as 1 rigidity object] according to claim 1 or 2.
[Claim 4] The fuel cell [equipped with a pressurization means to be formed in a contact edge with the each feeding-and-discarding member of said fuel of two or more of said layered products, and the laminating edge of the opposite side, and to pressurize these two or more layered products respectively in the direction of a laminating] according to claim 2 or 3.
[Claim 5] The fuel cell according to claim 2 or 3 which arranges these two or more layered products, and becomes about the electric polarity of each laminating edge of two or more of said layered products in contact with said fuel feeding-and-discarding member so that it may differ from the electric polarity of the laminating edge of the layered product which confronts each other on both sides of this fuel

feeding-and-discarding member.

[Claim 6] The fuel cell [equipped with the frictional resistance reduction means which makes small frictional resistance committed in the contact section of this layered product, or the contact section of this holddown member in case this layered product is moved to a part of contact section with said holddown member of said layered product, or contact section / at least / with this layered product of this holddown member, where this holddown member is contacted] according to claim 3.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the fuel cell equipped with two or more layered products which come to carry out the laminating of the cell in detail about a fuel cell.
[0002]
[Description of the Prior Art] The electromotive force per cell by the electrochemical reaction performed with a fuel cell is as low as 1.23V (nominal voltage) in the fuel cell which uses hydrogen and oxygen as a fuel. For this reason, the laminating of many cells is carried out and the fuel cell is usually constituted. In the fuel cell which comes to carry out a laminating, such a cell Rather than it carries out the laminating of a number required to obtain desired power since the precision of the laminating appears as internal resistance of all the cells and considers as one layered product A required number of cells can be equally divided into plurality, it can consider as two or more layered products, the direction which connects electrically to a serial the power obtained from two or more of these layered products can make precision of a laminating high easily, and a fuel cell with small internal resistance can be obtained easily.
[0003] Moreover, if the laminating of a number required to obtain desired power of all the cells is carried out and it is one layered product, laminating lay length will become long and it will become difficult to carry out the ** style of the fuel etc. to each cell which constitutes a layered product equally. If it considers as two or more layered products also in this case, since the ** style of the fuel can be carried out equally comparatively easily, an efficient fuel cell can be obtained easily.
[0004] What arranges the layered product of every two length in juxtaposition for such

a reason as a fuel cell which consists of two or more layered products conventionally in order that internal resistance may obtain a small efficient fuel cell easily, and is fixed with an up-and-down end plate, the things (for example, JP,5-89901,A etc.) which put the layered product of every four length (for example, JP,5-47407,A, JP,3-205766,A, etc.) on juxtaposition, and are fixed with an up-and-down end plate are proposed.

[0005]

[Problem(s) to be Solved by the Invention] However, in the fuel cell which consists of two or more such layered products, since feeding and discarding, such as a fuel, needed to be performed for every layered product, while piping for feeding and discarding, such as a fuel, also had to be installed for every layered product and installation of piping for feeding and discarding became complicated, there was a problem that equipment was enlarged.

[0006] In order to solve this problem, the fuel cells (for example, JP,5-109425,A etc.) which come to attach in one side of the laminating edge of a layered product the connection unit which equipped the interior with the passage used for feeding and discarding, such as a fuel, were also proposed, but since two or more layered products were connected to series by the connection unit attached in each layered product, it became difficult to carry out the ** style of the fuel etc. to each layered product equally, and there was a problem that where of the operation effectiveness of a fuel cell falls. In the fuel cell with which the ** style of the fuel etc. is not equally carried out to each layered product, since the pressure and the amount of supply of a fuel etc. differ from each other for every layered product, each layered products of all are not operated on suitable conditions, but a layered product with low operation effectiveness arises, and the operation effectiveness as the whole fuel cell is reduced.

[0007] Moreover, in the fuel cell using this connection unit, since two or more layered products were only connected to series by the connection unit attached in each layered product, when carried in a car etc., the layered product shifted by vibration which a car produces, fuel gas, cooling water, etc. leaked and there was a problem of the member which constitutes the layered product by the impact load suffering a loss. Although the attachment structures (for example, JP,5-82153,A etc.) which some fixing metal is incurvated and make elastic deformation possible were proposed to the problem based on vibration which such a car produces, since installation by fixing metal is required and spacing between layered products needed to be carried out for every layered product more than the amplitude of vibration, there was a problem that a tooth space required for installation of a fuel cell became large.

[0008] The fuel cell of this invention made installation easy, and took the next configuration for the purpose of attaining a miniaturization while it solved such a problem and carried out the ** style of the fuel etc. to each layered product equally.
[0009]
[Means for Solving the Problem] The fuel cell of this invention is a fuel cell equipped with two or more layered products which come to carry out the laminating of the cell, is pinched by said two or more layered products, and makes it a summary to have had the fuel feeding-and-discarding member which prepared the hole which performs the feeding and discarding of a fuel system to these two or more layered products at least in the contact section with these two or more layered products.
[0010] Here, in said fuel cell, the contact section with said fuel feeding-and-discarding member of two or more of said layered products is the laminating edge of this layered product, and it can also consider as the configuration these two or more layered products of whose were respectively equipped with the feeding-and-discarding passage of the fuel system of the direction of a laminating. Moreover, in said fuel cell, it can also consider as the configuration equipped with the holddown member which fixes said fuel feeding-and-discarding member and said layered product as 1 rigidity object. Or in said fuel cell, it is prepared in a contact edge with the each feeding-and-discarding member of said fuel of two or more of said layered products, and the laminating edge of the opposite side, and can also consider as the configuration equipped with a pressurization means to pressurize these two or more layered products respectively in the direction of a laminating. Furthermore, in said fuel cell, the electric polarity of each laminating edge of two or more of said layered products in contact with said fuel feeding-and-discarding member can also be considered as the configuration which arranges these two or more layered products, and becomes so that it may differ from the electric polarity of the laminating edge of the layered product which confronts each other on both sides of this fuel feeding-and-discarding member. Or in said combustion cell, where this holddown member is contacted, in case this layered product is moved to a part of contact section with said holddown member of said layered product, or contact section [at least] with this layered product of this holddown member, it can also consider as a configuration equipped with the frictional resistance reduction means which makes small frictional resistance committed in the contact section of this layered product, or the contact section of this holddown member.
[0011]
[Function] The fuel cell of this invention constituted as mentioned above performs the

feeding and discarding of a fuel system to two or more layered products at least from the hole with which the fuel feeding-and-discarding member pinched by two or more layered products was prepared in the contact section with two or more of these layered products. Consequently, it is not necessary to connect piping for the feeding and discarding of a fuel for every layered product, and a fuel cell becomes small.

[0012] In a fuel cell according to claim 2, a fuel feeding-and-discarding member performs the feeding and discarding of a fuel system to the feeding-and-discarding passage of the fuel system of the direction of a laminating of a layered product from the laminating edge of a layered product.

[0013] In a fuel cell according to claim 3, it makes it possible to deal with a fuel cell as 1 rigidity object by fixing a fuel feeding-and-discarding member and a layered product as 1 rigidity object by the holddown member.

[0014] In a fuel cell according to claim 4, a pressurization means pressurizes a layered product in the direction of a laminating from a contact edge with the fuel feeding-and-discarding member of a layered product, and the laminating edge of the opposite side.

[0015] In a fuel cell according to claim 5, each layered product is electrically connectable with a serial easily by making the electric polarity of each laminating edge of two or more layered products in contact with a fuel feeding-and-discarding member into a different polarity.

[0016] In a fuel cell according to claim 6, where a holddown member is contacted, in case the frictional resistance reduction means formed in a part of contact surface with the holddown member of a layered product or contact surface [at least] with the layered product of a holddown member moves a layered product, frictional resistance committed in the contact section of a layered product or the contact section of a holddown member is made small.

[0017]

[Example] In order to clarify further a configuration and an operation of this invention explained above, the suitable example of this invention is explained below. Drawing 1 is an explanatory view which illustrates the outline of the fuel cell 10 which is one suitable example of this invention.

[0018] A fuel cell 10 consists of feeding-and-discarding members 40, such as a fuel which performs feeding and discarding, such as a fuel to four layered products 12A-12D which carry out the laminating of the cell and become, and these layered products 12A-12D, the upper housing 80 and lower housing 90 which form the stowage container of layered products 12A-12D, and a pressurization device 110 in

which the pressure of the direction of a laminating is applied to layered products 12A-12D so that it may illustrate. Each configuration member is explained below.

[0019] Drawing 2 is a perspective view which illustrates the outline of the configuration of the cell 13 which constitutes layered products 12A-12D, and the cooling member 30. A cell 13 is a cell of a polymer electrolyte fuel cell, and it consists of an electrolyte membrane 14, two gas diffusion electrodes 16 which form sandwich structure on both sides of this electrolyte membrane 14 from both sides, and two collectors 20 which pinch this sandwich structure from both sides so that it may illustrate.

[0020] Electrolyte membranes 14 are 100 micrometers in polymeric materials, for example, thickness formed of fluororesin, and 200-micrometer ion exchange membrane, and show good electrical conductivity according to a damp or wet condition. Both two gas diffusion electrodes 16 are formed of the carbon cross woven with the yarn which consists of a carbon fiber. The carbon powder which supported the alloy which consists of the platinum as a catalyst or platinum, and other metals is scoured in the front face and clearance by the side of the electrolyte membrane 14 of this carbon cross. This electrolyte membrane 14 and two gas diffusion electrodes 16 After two gas diffusion electrodes 16 have considered as sandwich structure on both sides of an electrolyte membrane 14 100 degrees C cannot be found and 160 degrees C is 110 degrees C thru/or 130 degrees C in temperature preferably. 1 -- MPa {10.2 kgf/cm2} thru/or 20 -- MPa(s) {204 kgf/cm2} -- desirable -- 8 -- MPa(s) {82 kgf/cm2} thru/or 15 -- it is joined by the hot pressing which the pressure of MPa(s) {153 kgf/cm2} is made to act, and is joined.

[0021] The collector 20 is formed with the substantia-compacta carbon which compressed and carried out eburnation of the carbon and it presupposed gas un-penetrating. The field (laminating side) in contact with the gas diffusion electrode 16 of a collector 20 is formed in the shape of a square, and the cooling water holes 21 and 22 with a circular cross section are formed in up both the corners in drawing of this field. When these cooling water holes 21 and 22 form a layered product, they form the passage of the cooling water which penetrates a layered product in the direction of a laminating. Moreover, the holes (fuel gas hole) 23 and 24 of a long and slender pair and the holes (oxidation gas eye) 25 and 26 of a pair are formed near the edge of each side of the laminating side of a collector 20 along the side. When these fuel gas holes 23 and 24 and the oxidation gas eyes 25 and 26 form a layered product, they form the passage which penetrates the layered product of the oxidation gas containing the fuel gas containing hydrogen, and oxygen in the direction of a laminating.

[0022] Two or more slots 27 parallel to the longitudinal direction of the fuel gas hole 23 of a pair and the oxidation gas eyes 25 and 26 of the pair which connects between 24 are formed in one side (rear face in drawing) of the laminating side of a collector 20, and the oxidation gas eye 25 of a pair and the slot 28 which connects between 26 are formed in another side (screen in drawing) of a laminating side. This slot 27 and slot 28 lie at right angles, and the passage of oxidation gas or fuel gas is made on the front face of a gas diffusion electrode 16, respectively. In addition, a collector 20 is arranged so that a slot 27 and a slot 28 may confront each other on both sides of an electrolyte membrane 14 and a gas diffusion electrode 16.

[0023] The cooling member 30 is formed with the same substantia-compacta carbon as a collector 20. The cooling water holes 31 and 32, the fuel gas holes 33 and 34, and the oxidation gas eyes 35 and 36 of the same configuration are formed in the same location as the cooling water holes 21 and 22, the fuel gas holes 23 and 24, and the oxidation gas eyes 25 and 26 which were formed in the laminating side of a collector 20 in the laminating side of the cooling member 30. The cooling water holes 31 and 32 form the passage of cooling water with the cooling water holes 21 and 22 of a collector 20, and the fuel gas holes 33 and 34 and the oxidation gas eyes 35 and 36 form the passage of fuel gas and oxidation gas with the fuel gas holes 23 and 24 and the oxidation gas eyes 25 and 26 of a collector 20. Moreover, the meandering slot 38 from the cooling water hole 31 to the cooling water hole 32 is formed in one side (screen in drawing) of the laminating side of the cooling member 30 with the rib 37. This slot 38 forms the path of cooling water in respect of the laminating in which the slot on the collector (not shown) in which either a slot 27 or the slot 28 is not formed is not formed.

[0024] In this way, the laminating of the cooling member 30 is carried out to the constituted cell 13, and layered products 12A-12D are formed. Under the present circumstances, the ratio in the layered product of a cell 13 and the cooling member 30 becomes settled according to conditions, such as calorific value of a cell 13, temperature of cooling water, and a flow rate of cooling water. In the example, the laminating of a cell 13 and the cooling member 30 was carried out by the ratio of 3:1, and layered products 12A-12D were formed.

[0025] Drawing 3 is a perspective view which illustrates a general view of the feeding-and-discarding members 40, such as a fuel. The explanatory view in which drawing 4 illustrated the passage for supply of the fuel gas of the feeding-and-discarding members 40, such as a fuel, the explanatory view in which drawing 5 illustrated the passage for discharge of the fuel gas of the

feeding-and-discarding members 40, such as a fuel, and drawing 6 are the explanatory views which illustrated the passage for supply and the passage for discharge of oxidation gas of the feeding-and-discarding members 40, such as a fuel. Moreover, drawing 7 , drawing 8 , drawing 9 , and drawing 10 are A-A line sectional views of the feeding-and-discarding member 40, such as a fuel shown in drawing 3 , a B-B line sectional view, a C-C line sectional view, and D-D line sectional view.

[0026] The feeding-and-discarding members 40, such as a fuel, are formed in the rectangular parallelepiped configuration of aluminum. The feeding-and-discarding members 40, such as this fuel, are members which return the exhaust gas and the cooling water by the side of the exhaust gas by the side of the fuel gas discharged from layered products 12A-12D, and oxidation gas to fuel gas feeding-and-discarding equipment, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment while supplying the fuel gas, the oxidation gas, and the cooling water from the fuel gas feeding-and-discarding equipment which is not illustrated, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment to layered products 12A-12D. For this reason, the passage for the feeding and discarding of the cooling water which connects the passage and the cooling water feeding-and-discarding equipment, and each layered products 12A-12D for the feeding and discarding of the oxidation gas which connects the passage, the oxidation gas feeding-and-discarding equipment, and each layered products 12A-12D for the feeding and discarding of the fuel gas which connects the fuel gas feeding-and-discarding equipment explained below and each layered products 12A-12D is formed in the feeding-and-discarding members 40, such as a fuel.

[0027] First, the passage for the feeding and discarding of cooling water is explained. The cooling water feed hoppers 42A-42D which receive supply of cooling water from cooling water feeding-and-discarding equipment are formed in both the sides of the center of the top face in drawing 3 of the feeding-and-discarding member 40, such as a fuel, and the cooling water exhaust ports 46A-46D which return cooling water to cooling water feeding-and-discarding equipment are formed in the four corners of this field. Moreover, in the center of the upper part of the right lateral of these drawings of the feeding-and-discarding member 40, such as a fuel, the cooling water supply end connections 44A and 44B which supply the cooling water from cooling water feeding-and-discarding equipment to layered products 12A and 12B are formed, and the cooling water discharge end connections 48A and 48B which receive the cooling water discharged from layered products 12A and 12B are formed in up both the corners of this field. In addition, the cooling water supply end connections 44C and

44D and the cooling water discharge end connections 48C and 48D are formed in the field (left lateral of the feeding-and-discarding members 40, such as a fuel shown in drawing 1) which counters this field (right lateral in drawing 3) as well as this field. These cooling water feed hoppers 42A-42D and the cooling water supply end connections 44A-44D are connected by the paths (cooling water supply path) 43A-43D which broke into the right angle like the cooling water supply paths 43B and 43D shown in drawing 10 . Moreover, the cooling water exhaust ports 46A-46D and the cooling water discharge end connections 48A-48D are also connected by the paths (cooling water discharge path) 47A-47D which broke into the right angle like the cooling water discharge paths 47A and 47C illustrated to drawing 7 .

[0028] Therefore, while the feeding-and-discarding members 40, such as a fuel, supply the cooling water from cooling water feeding-and-discarding equipment to layered products 12A-12D through the cooling water feed hoppers 42A-42D, the cooling water supply paths 43A-43D, and the cooling water supply end connections 44A-44D The cooling water discharged from layered products 12A-12D is returned to cooling water feeding-and-discarding equipment through the cooling water discharge end connections 48A-48D, the cooling water discharge paths 47A-47D, and the cooling water exhaust ports 46A-46D.

[0029] Next, the passage for the feeding and discarding of the fuel gas of the feeding-and-discarding members 40, such as a fuel, is explained. In the center of the right lateral in drawing 3 of the feeding-and-discarding member 40, a fuel etc. Two long and slender fuel gas supply end connections 62A and 62B are formed in the bottom of drawing Nakagami who supplies the fuel gas from fuel gas feeding-and-discarding equipment to layered products 12A and 12B. Two long and slender fuel gas discharge end connections 64A and 64B which accept the exhaust gas by the side of the fuel gas discharged from layered products 12A and 12B are formed near the edge of the side which counters the fuel gas supply end connections 62A and 62B of this field. In addition, the same fuel gas supply end connections 62C and 62D as this field and the fuel gas discharge end connections 64C and 64D are formed also in the field (left lateral of the feeding-and-discarding members 40, such as a fuel shown in drawing 1) which counters this field (drawing 3 Nakamigi side face).

[0030] As shown in drawing 4 , a fuel etc. is parallel to the top face in [the **** end face in drawing to] drawing, and a right lateral, and the fuel gas feeder current way 51 of a circular cross section and the cutting hole 53 of a rectangle cross section are formed in the feeding-and-discarding member 40. The fuel gas feed hopper 50 formed in the **** end face in drawing of this fuel gas feeder current way 51 is connected to

the fuel gas feeding-and-discarding equipment which is not illustrated. The cutting hole 53 and a cross-section configuration are the same to the cutting hole 53, fuel gas distribution room formation member 54A shorter than the die length of the longitudinal direction is fitted in it, and the fuel gas distribution room 54 is formed in the maximum inner of the cutting hole 53. Moreover, the fuel gas communication passage 52 of the same circular cross section as the fuel gas feeder current way 51 is formed in the direction of a vertical at the feeding-and-discarding members 40, such as a fuel, from the center of the top face in drawing 4 (upper limb in drawing 9). Fuel gas passage formation member 52A which carried out the same cross-section configuration as the fuel gas communication passage 52 from the top face in drawing 4 is fitted in this fuel gas communication passage 52. Moreover, it has connected with the fuel gas distribution room 54 by the point, and the fuel gas feeder current way 51 is connected with the fuel gas feeder current way 51 directly under fuel gas passage formation member 52A. Therefore, the fuel gas feeder current way 51 is connected to the fuel gas distribution room 54 by the fuel gas communication passage 52. The fuel gas distribution room 54 is connected to the fuel gas supply end connections 62A-62D from the fuel gas distribution room 54 by the fuel gas supply paths 63A-63D where the cross section becomes large towards the fuel gas supply end connections 62A-62D so that it may illustrate to drawing 10 .

[0031] Moreover, as shown in drawing 5 , from the **** end face in drawing, it is parallel to the top face in drawing, and a right lateral, and the cutting hole 56 of an abbreviation 5 square-shape cross section is formed in the feeding-and-discarding members 40, such as a fuel. The cutting hole 56 and a cross-section configuration are the same to this cutting hole 56, fuel gas outflow way formation member 57A with the short die length of that longitudinal direction is fitted in it from the **** end face in drawing, and the fuel gas outflow way 57 is formed by the cutting hole 56 and fuel gas outflow way formation member 57A. The fuel gas discharge communication passage 58 of a circular cross section is formed in the bottom of the end face by the side of the transverse plane in drawing of the fuel gas outflow way 57, and the fuel gas exhaust port 59 formed in the transverse plane in drawing is connected with. The fuel gas exhaust port 59 is connected to the fuel gas feeding-and-discarding equipment which is not illustrated. The fuel gas outflow way 57 is connected to the fuel gas discharge end connections 64A-64D from the fuel gas outflow way 57 by the fuel gas discharge paths 65A-65D where the cross section becomes large towards the fuel gas discharge end connections 64A-64D so that it may illustrate to drawing 7 .

[0032] Therefore, the feeding-and-discarding members 40, such as a fuel While

supplying the fuel gas from fuel gas feeding-and-discarding equipment to layered products 12A-12D through the fuel gas feed hopper 50, the fuel gas feeder current way 51, the fuel gas communication passage 52, the fuel gas distribution room 54, the fuel gas supply paths 63A-63D, and the fuel gas supply end connections 62A-62D The exhaust gas of the fuel gas discharged from layered products 12A-12D is returned to fuel gas feeding-and-discarding equipment through the fuel gas discharge end connections 64A-64D, the fuel gas discharge paths 65A-65D, the fuel gas outflow way 57, the fuel gas discharge communication passage 58, and the fuel gas exhaust port 59.

[0033] In addition, each passage by the side of supply of the fuel gas formed in the feeding-and-discarding members 40, such as a fuel from fuel feeding-and-discarding equipment to each layered products 12A-12D, (the fuel gas feeder current way 51, the fuel gas communication passage 52, the fuel gas distribution room 54, and fuel gas supply paths 63A-63D) is carrying out the same configuration, respectively. Each passage by the side of discharge of the exhaust gas by the side of the fuel gas formed in the feeding-and-discarding members 40, such as a fuel from each layered products 12A-12D to fuel feeding-and-discarding equipment, (the fuel gas discharge paths 65A-65D, the fuel gas outflow way 57, the fuel gas discharge communication passage 58, and fuel gas exhaust port 59), respectively the same configuration Since it is carrying out, fuel gas is equally supplied to each layered products 12A-12D from the feeding-and-discarding members 40, such as a fuel, and the exhaust gas by the side of fuel gas is equally discharged from each layered products 12A-12D to the feeding-and-discarding members 40, such as a fuel.

[0034] Next, the passage for the feeding and discarding of the oxidation gas of the feeding-and-discarding members 40, such as a fuel, is explained. The oxidation gas distribution slot 70 which consists of four slots formed towards the direction of four corners from the circular ring-like slot and the slot of the shape of this circular ring is formed in the center section of the top face in drawing 3 of the feeding-and-discarding member 40, such as a fuel. The oxidation gas supply openings 71A-71D with a circular cross section are formed in the point of four slots formed towards the direction of four corners of this oxidation gas distribution slot 70. This oxidation gas distribution slot 70 is connected to the oxidation gas feeding-and-discarding equipment which is not illustrated. Two long and slender oxidation gas supply end connections 72A and 72B which supply the oxidation gas from oxidation gas feeding-and-discarding equipment to layered products 12A and 12B are formed in the upper part of the right lateral in drawings of the feeding-and-discarding member 40, such as a fuel, and two long and slender oxidation

gas discharge end connections 74A and 74B which accept the exhaust gas by the side of the oxidation gas discharged from layered products 12A and 12B are formed in the lower part. In addition, the same oxidation gas supply end connections 72C and 72D as this field and the oxidation gas discharge end connections 74C and 74D are formed also in the field (left lateral of the feeding-and-discarding members 40, such as a fuel shown in drawing 1) which counters this field (right lateral in drawing 3).

[0035] As shown in drawing 6 and drawing 8 , the oxidation gas supply openings 71A-71D are connected to the oxidation gas supply end connections 72A-72D from the oxidation gas supply openings 71A-71D by the oxidation gas supply paths 73A-73D where the cross section becomes large towards the oxidation gas supply end connections 72A-72D.

[0036] Moreover, the crevice of a circular cross section and the oxidation gas discharge section 78 which consists of four slots formed towards the direction of four corners from this crevice are formed in the bottom rear face in drawing 6 of the feeding-and-discarding member 40, such as a fuel. The oxidation gas exhaust 76A-76D where a cross section is circular is formed in the point of four slots formed towards the direction of four corners of this oxidation gas discharge section 78. The oxidation gas exhaust 76A-76D is connected to the oxidation gas discharge end connections 74A-74D from the oxidation gas exhaust 76A-76D by the oxidation gas discharge paths 75A-75D where the cross section becomes large towards the oxidation gas discharge end connections 74A-74D, as shown in drawing 6 and drawing 8 .

[0037] Therefore, while the feeding-and-discarding members 40, such as a fuel, supply the oxidation gas from oxidation gas feeding-and-discarding equipment to layered products 12A-12D through the oxidation gas distribution slot 70, the oxidation gas supply openings 71A-71D, the oxidation gas supply paths 73A-73D, and the oxidation gas supply end connections 72A-72D The exhaust gas of the oxidation gas discharged from layered products 12A-12D is returned to fuel gas feeding-and-discarding equipment through the oxidation gas discharge end connections 74A-74D, the oxidation gas discharge paths 75A-75D, the oxidation gas exhaust 76A-76D, and the oxidation gas discharge section 78.

[0038] In addition, each passage by the side of supply of the oxidation gas formed in the feeding-and-discarding members 40, such as a fuel from oxidation gas feeding-and-discarding equipment to each layered products 12A-12D, (the oxidation gas distribution slot 70, the oxidation gas supply openings 71A-71D, and oxidation gas supply paths 73A-73D) is carrying out the same configuration, respectively. Since

each passage by the side of discharge of the exhaust gas by the side of the oxidation gas formed in the feeding-and-discarding members 40, such as a fuel from layered products 12A-12D to oxidation gas feeding-and-discarding equipment, (the oxidation gas discharge paths 75A-75D, the oxidation gas exhaust 76A-76D, and oxidation gas discharge section 78) is also carrying out the same configuration, respectively Oxidation gas is equally supplied to each layered products 12A-12D from the feeding-and-discarding members 40, such as a fuel, and the exhaust gas by the side of oxidation gas is equally discharged from each layered products 12A-12D to the feeding-and-discarding members 40, such as a fuel.

[0039] Next, the structure of upper housing 80 is explained. The E-E line sectional view of the upper housing 80 which showed drawing 11 to drawing 1 , and drawing 12 are the F-F line sectional views of the upper housing 80 shown in drawing 1 . Upper housing 80 is formed of steel plate material, and as shown in drawing 1 , drawing 11 , and drawing 12 , it consists of the upper part 81 and two flanks 82 which bent at the right angle from this upper part 81. The rib section 84 is formed in the upper part 81 of punching. The rib section 84 is equipped with the guide section 85 which bent and formed both the side in drawing Nakashita as shown in drawing 11 . The bend 86 of a hemicycle is formed in the perimeter to which the upper part 81 was pierced for the cross section. As shown in drawing 11 and drawing 12 , the guide section 85 of the rib section 84 and the same guide section 87 are formed in the part which counters the guide section 85 of the rib section 84 of a bend 86. In case this guide section 85 and the guide section 87 carry out the laminating of the layered products 12A-12D, they guide a cell 13. The rigidity of upper housing 80 is raised by such the rib section 84, the guide section 85, a bend 86, and the guide section 87. The bolthole for fixing upper housing 80 to the feeding-and-discarding members 40, such as a fuel, and the pressurization device 110 is formed in the both ends connected with the feeding-and-discarding members 40, such as a fuel of the upper part 81 and a flank 82, and the pressurization device 110.

[0040] Next, the structure of lower housing 90 is explained. The G-G line sectional view of the lower housing 90 which showed drawing 13 to drawing 1 , and drawing 14 are the H-H line sectional views of the lower housing 90 shown in drawing 1 . Lower housing 90 is formed of steel plate material like upper housing 80, and as shown in drawing 1 , drawing 13 , and drawing 14 , it consists of a pars basilaris ossis occipitalis 91 and two flanks 92 which bent at the right angle from this pars basilaris ossis occipitalis 91. As shown in drawing 1 and drawing 13 , the bend 94 is formed in the location which counters the rib section 84 of the upper housing 80 of a pars basilaris

ossis occipitalis 91 so that a cross section may become drawing 13 Nakagami with a convex with a hemicycle. Moreover, the bend 96 of the same configuration as a bend 94 is formed in the edge which counters the bend 94 of a pars basilaris ossis occipitalis 91, and the edge connected with the pressurization device 110. As shown in drawing 14 , the bend 98 is formed in the edge connected with the feeding-and-discarding members 40, such as a fuel of a pars basilaris ossis occipitalis 91, in the same configuration as a bend 94 so that it may become drawing 14 Nakashita with a convex. The bend 96 and bend 94 which counter a bend 94 are used for positioning at the time of carrying out the laminating of the layered products 12A-12D. Moreover, the rigidity of lower housing 90 raises and shines by such bends 94, 96, and 98. The bolthole for fixing each lower housing 90 to the feeding-and-discarding members 40, such as a fuel, and the pressurization device 110 is formed in the both ends connected with the feeding-and-discarding members 40, such as a fuel of a pars basilaris ossis occipitalis 91 and a flank 92, and the pressurization device 110.

[0041] The terminal hole 99 of the rectangle which takes out terminal 100A formed in the terminal assembly 100 arranged at the laminating edge of the layered product whose feeding-and-discarding members 40, such as a fuel, are pinched is formed near the edge connected to the feeding-and-discarding members 40, such as a fuel of the flank 92 of lower housing 90. Two terminals 100A which confronts each other on both sides of the feeding-and-discarding members 40, such as this fuel, can be connected as shown in drawing 15 . The situation of connection is shown in drawing 15 . The terminal assembly 100 is formed in tabular [rectangular] with the electrical conducting material, and projected terminal 100A is formed in one of them so that it may illustrate. When this terminal 100A attaches a fuel cell 10, it projects from the terminal hole 99 of each lower housing 90. The engagement section 104 which can engage with the connection plate 102 which connects between terminal 100A at this terminal 100A is formed in both ends. Connection between terminal 100A is performed by making this engagement section 104 engage with terminal 100A. In the fuel cell 10 of an example, connection of layered product 12A, layered product 12C, and layered product 12B and layered product 12D is carried out with the connection plate 102.

[0042] Moreover, connection of layered product 12C and the layered product 12D is carried out also at the laminating edge by the side of the pressurization device 110. The situation of the connection of layered product 12C and layered product 12D is shown in drawing 16 . The terminal assembly 106 with which the engagement heights 107 were formed is installed in the layered product 12D side, and the terminal

assembly 108 with which the engagement heights 107 and the engagement crevice 109 which can be engaged were formed in the laminating edge of layered product 12D at the layered product 12C side is installed in the laminating edge of layered product 12C so that it may illustrate. These engagement heights 107 and the engagement crevice 109 are in the engaged condition, and can be slid in the direction of a laminating by the thickness of a terminal assembly 106 (terminal assembly 108). Therefore, even if the laminating lay length of layered product 12C and layered product 12D changes a little with manufacture errors of a cell 13 etc., it can connect.

[0043] When carrying out the laminating of the layered products 12A–12D with the fuel cell 10 of an example here, Layered product 12A and layered product 12C are formed for the collector 20 which constitutes a cell 13 as the same direction (for example, sense which the slot 27 of a collector 20 becomes a drawing Nakamigi side as shown in drawing 2). Since layered product 12B and layered product 12D are formed as opposite sense (for example, sense which the collector 20 in drawing 2 is rotated 180 degrees centering on the slot located in the center of a slot 28, and a slot 28 becomes the drawing 2 Nakamigi side), a collector 20 If layered product 12A and layered product 12C are connected with the connection plate 102, layered product 12C and layered product 12D are connected by the engagement heights 107 and the engagement crevice 109 and layered product 12D and layered product 12B are connected with the connection plate 102 Each layered products 12A–12D are connected to a serial in order of layered products 12A, 12C, 12D, and 12B. Therefore, if a terminal assembly 100 is installed in the laminating edge by the side of the pressurization device 110 of layered product 12A and layered product 12B so that terminal 100A formed in the terminal assembly 100 may become drawing 1 Nakagami, this terminal 100A becomes the output terminal of a fuel cell 10, and can obtain power from this terminal 100A.

[0044] Next, the pressurization device 110 is explained. Drawing 1717 is an explanatory view which illustrates the configuration of the pressurization device 110. The pressurization device 110 consists of a rotation prevention member 120 which transmits the reaction force accompanying the pressurization which acts on the pressurization bolt 140 which mentions the pressurization device 110 later to the tie–down plate 112 attached in upper housing 80 and lower housing 90, and this tie–down plate 112, a pressurization member 130 which makes the pressure of the direction of a laminating act on each layered products 12A–12D, and a pressurization bolt 140 which makes thrust act on the pressurization member 130 so that it may illustrate. The through tube 114 of two forward octagons is formed in the tie–down

plate 112, and fitting of the rotation prevention member 120 is carried out to this through tube 114.

[0045] Drawing 18 is the explanatory view which looked at the rotation prevention member 120 from the drawing 17 Nakamigi side. The rotation prevention member 120 consists of the circular plinth section 122 which transmits the reaction force accompanying the pressurization which acts on the pressurization bolt 140 to a tie-down plate 112, and the fitting section 124 which can fit into the through tube 114 of a tie-down plate 112 with a forward octagon so that it may illustrate. The through tube 126 which penetrates the fitting section 124 is formed in the center of the fitting section 124, and the front face of a through tube 126 is formed so that it may screw with the screw-thread-fornation section 144 of the pressurization bolt 140 mentioned later. In addition, the rotation prevention member 120 shown in drawing 17 is the J-J line sectional view of the rotation prevention member 120 of drawing 18 .

[0046] Drawing 19 is the explanatory view which looked at the pressurization member 130 from the drawing 17 Nakamigi side. The pressurization member 130 consists of the disk 132 which makes thrust act on the laminating edge of layered products 12A-12D, a pressurization shaft 136 attached in the center of this disk 132, and a disk 132 and the pressurization rib 134 of the triangle which reinforces the pressurization shaft 136 so that it may illustrate. The pressurization crevice 138 of a semi-sphere configuration is formed in the edge (right end section in drawing 17) of the pressurization shaft 136.

[0047] As the pressurization bolt 140 is shown in drawing 17 , one edge 142 is formed in the semi-sphere configuration so that it may have consistency with the pressurization crevice 138 of the pressurization member 130, and the other-end section 146 is formed so that the cross section may serve as a hexagon. Between the edge 142 of the pressurization bolt 140, and the edge 146, the screw-thread-fornation section 144 screwed in the through tube 126 of the rotation prevention member 120 is formed.

[0048] In this way, the constituted pressurization device 110 makes the pressure of the direction of a laminating act on layered products 12A-12D as follows. If the pressurization bolt 140 screwed in the through tube 126 of the rotation prevention member 120 is rotated, the pressurization bolt 140 will move to the longitudinal direction in drawing 17 . If the pressurization bolt 140 is rotated and the pressurization bolt 140 is moved leftward in this drawing, the edge 142 of the pressurization bolt 140 will contact the pressurization crevice 138 of the pressurization member 130, and the pressurization member 130 will be moved leftward. For this reason, the pressure of

the direction of a laminating is applied to layered products 12A-12D with the disk 132 of the pressurization member 130.

[0049] If the fuel gas feeding-and-discarding equipment, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment which are not illustrated are connected to the feeding-and-discarding members 40, such as a fuel of the fuel cell 10 constituted by each such configuration member, and fuel gas, oxidation gas, and cooling water are supplied, a fuel cell 10 will perform electrochemical reaction shown in a degree type, and will change chemical energy into direct electrical energy.

[0050] cathode reaction (oxygen pole): -- 2H++2e-+(1/2) O2 ->H2O anode reaction (fuel electrode): -- H2 ->2H++2e- [0051] According to the fuel cell 10 of an example explained above, connection can lessen a connection place and connecting piping as compared with a required fuel cell for every layered product that what is necessary is just to connect the feeding-and-discarding member 40 and fuel gas feeding-and-discarding equipments, such as a fuel, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment for the feeding and discarding of the fuel gas to each layered products 12A-12D, oxidation gas, and cooling water. Consequently, the installation tooth space of a fuel cell 10 can be made small, and installation of a fuel cell 10 can be made easy. Moreover, since the feeding-and-discarding member 40 and four layered products 12A-12D, such as a fuel, are unified and it considers as 1 rigidity object, a fuel cell 10 can be easily installed in a car etc.

[0052] Moreover, since the feeding-and-discarding members 40, such as a fuel, are pinched by layered products 12A-12D, the feeding and discarding of the fuel gas from the contact surface of the layered products 12A-12D of the feeding-and-discarding members 40, such as a fuel, to layered products 12A-12D, oxidation gas, and cooling water are performed and a pressure is applied according to the pressurization device 110 from the other end of layered products 12A-12D, sufficient seal nature for the contact surface of the feeding-and-discarding members 40, such as a fuel, and layered products 12A-12D is securable. Consequently, the leakage of fuel gas etc. can be prevented.

[0053] Furthermore If each passage by the side of supplies of the feeding-and-discarding member 40, such as a fuel from fuel gas feeding-and-discarding equipment and oxidation gas feeding-and-discarding equipment to each layered products 12A-12D, is made into the same configuration for every layered product Since each passage by the side of discharge of the

feeding-and-discarding member 40, such as a fuel from each layered products 12A-12D to [both] fuel gas feeding-and-discarding equipment and oxidation gas feeding-and-discarding equipment, was also made into the same configuration for every layered product Fuel gas and oxidation gas can be equally supplied to each layered products 12A-12D from the feeding-and-discarding members 40, such as a fuel, and the exhaust gas by the side of fuel gas and oxidation gas can be equally discharged from each layered products 12A-12D to the feeding-and-discarding members 40, such as a fuel. Consequently, each layered products 12A-12D can be operated on the same conditions, and it can consider as a fuel cell with sufficient operation effectiveness.

[0054] In the fuel cell 10 of an example, since it was made for the location of a cell 13 to become settled when piercing upper housing 80, forming the guide section 85 and the guide section 87 in the rib section 84 and the bend 86 which counters the rib section 84, respectively, forming bends 94 and 96 in lower housing 90 further and carrying out the laminating of the layered products 12A-12D, precision can improve each layered products 12A-12D a laminating. Consequently, it can consider as a fuel cell with small internal resistance. Moreover, in the fuel cell 10 of an example, since upper housing 80 was pierced, the laminating condition of layered products 12A-12D can be checked, and it can maintain easily. Furthermore, in the fuel cell 10 of an example, since pressurization by the pressurization device 110 is performed for every layered products 12A-12D, the pressure applied for every layered products 12A-12D can be adjusted, and it can maintain for every layered products 12A-12D.

[0055] In addition, although the feeding-and-discarding members 40, such as a fuel which is pinched by four layered products 12A-12D, and performs feeding and discarding, such as fuel gas to these four layered products 12A-12D, were used in the fuel cell 10 of an example For example, the configuration using feeding-and-discarding members, such as a fuel which is pinched by two layered products and performs feeding and discarding, such as fuel gas to two layered products, The configuration using feeding-and-discarding members, such as a fuel which is pinched by even layered products, such as six layered products or eight layered products, and performs feeding and discarding, such as fuel gas to even layered products, is also suitable. Moreover, it is good also as feeding-and-discarding members, such as a fuel supported from many by three or more layered products [odd].

[0056] Although the fuel gas feed hopper 50 and the fuel gas exhaust port 59 were formed in the field where the feeding-and-discarding members 40, such as a fuel, counter in the example, the configuration formed in the same field is also suitable.

Moreover, in the example, although the feeding-and-discarding members 40, such as a fuel, were formed by aluminum, you may form with resin, such as alloys, such as other metals, such as iron, and an aluminium alloy, other metals, and engineering plastics, etc. Furthermore, although cutting was performed to the single member and the passage of fuel gas feeder current way 51 grade was formed in the interior of the feeding-and-discarding members 40, such as a fuel, in the example, feeding-and-discarding members, such as a fuel which joined two or more members which performed cutting beforehand, and equipped the interior with passage, such as a fuel gas feeder current way, may be formed.

[0057] Although the feeding-and-discarding passage of fuel gas, the feeding-and-discarding passage of oxidation gas, and the feeding-and-discarding passage of cooling water were formed in the feeding-and-discarding members 40, such as a fuel, in the example, it is good also as a configuration which forms any one feeding-and-discarding passage or any two feeding-and-discarding passage. For example, depending on the service condition of a fuel cell, cooling water may be unnecessary and does not need to form paths, such as the cooling water supply paths 43A-43D, in this case.

[0058] Although each layered products 12A-12D were electrically connected to the serial in the example in order of layered products 12A, 12C, 12D, and 12B with the connection plate 102, the terminal assembly 106, and the terminal assembly 108 It is electrically good also as juxtaposition in two groups which could connect electrically each layered products 12A-12D to juxtaposition, connected to the serial electrically two [at a time] of each layered products 12A-12D, and were connected to this serial.

[0059] When connecting electrically each layered products 12A-12D to juxtaposition, the electric polarity of the laminating edge of the layered product which confronts each other on both sides of the feeding-and-discarding members 40, such as a fuel, is good also as the same polarity, and good also as a different polarity. In this case, a terminal assembly 100 may be installed in both the laminatings edge of each layered products 12A-12D, and power may be taken out from each layered products 12A-12D through terminal 100A formed in this terminal assembly 100, respectively. Moreover, the laminating edge by the side of the pressurization device 110 of each layered products 12A-12D may be grounded, and a plus pole or a minus pole may be taken out from the laminating edge by the side of the feeding-and-discarding members 40, such as a fuel. When grounding the laminating edge by the side of the pressurization device 110 of each layered products 12A-12D, the laminating of each layered products 12A-12D is carried out so that each laminating edge by the side of the pressurization

device 110 of each layered products 12A-12D may serve as a minus pole or a plus pole.

[0060] It connects with a serial electrically two [at a time] of each layered products 12A-12D. When [linked to this serial] connecting 2 sets to juxtaposition electrically, layered product 12A, layered product 12C and layered product 12B, and layered product 12D may be connected to a serial with the connection plate 102, respectively. Layered product 12A, layered product 12B and layered product 12C, and layered product 12D may be connected to a serial with a terminal assembly 106 and a terminal assembly 108, respectively. When connecting layered product 12A and layered product 12B to a serial, the laminating edge by the side of the pressurization device 110 of layered product 12A and layered product 12B is connected with a terminal assembly 106 and a terminal assembly 108, an output terminal may be taken out from the feeding-and-discarding member 40 sides, such as a fuel, the laminating edge by the side of the feeding-and-discarding members 40, such as a fuel, may be connected with a terminal assembly 106 and a terminal assembly 108, and an output terminal may be taken out from the pressurization device 110 side.

[0061] Next, the situation at the time of carrying the fuel cell 10 of an example in an automobile 200 is explained. The top view and drawing 20 (b) which showed an example of the arrangement at the time of drawing 20 (a) carrying fuel cell 10 grade in an automobile 200 are the side elevation of arrangement of this fuel cell 10 grade. As shown in drawing 20 (a), in an automobile 200 Store the mixture of a fuel cell 10, a methanol, and water, and a methanol is reformed. To a fuel cell 10, fuel gas Supply of water from the fuel tank 220 to supply, the methanol reformer 222 which accepts the exhaust gas by the side of the fuel gas discharged from a fuel cell 10, and is reproduced to a methanol, the cooling water tank 224 which supplies cooling water to a fuel cell 10, and a cooling water tank 224 The radiator 228 grade which cools the humidifier 226 which wins popularity and humidifies fuel gas, and the cooling water discharged from the fuel cell 10 by heat exchange with the open air is carried.

[0062] Here, by this automobile 200, a fuel tank 220 and the methanol reformer 222 are carried as fuel gas feeding-and-discarding equipment connected to a fuel cell 10, and the cooling water tank 224 and the radiator 228 are carried as cooling water feeding-and-discarding equipment. Moreover, the automobile 200 carries the compressor which pressurizes a predetermined pressure and supplies the open air to a fuel cell 10 as oxidation gas feeding-and-discarding equipment and which is not illustrated. In addition, while changing into three-phase-circuit alternating voltage the direct current voltage outputted from a fuel cell 10, the motor 214 grade driven with

the three-phase-circuit alternating voltage from an inverter 210,212 or an inverter 210,212 which controls the amplitude and a frequency is also carried in the automobile 200.

[0063] As shown in drawing 20 (b), the fuel cell 10, the humidifier 226, the inverter 210,212, and the motor 214 are installed in the bottom of the backseat 240 installed near the center of an automobile 200. Moreover, the radiator 228 is installed in the bottom of the foremost part of an automobile 200. Here, since the fuel cell 10 is attached as 1 rigidity object, it shows the behavior as one body to vibration of an automobile 200. Since the feeding-and-discarding members 40, such as a fuel, are connected to a fuel tank 220, the methanol reformer 222, and a cooling water tank 224 by connecting piping etc., the installation to the automobile 200 of a fuel cell 10 is attached so that the feeding-and-discarding members 40, such as a fuel, may not vibrate greatly by vibration at the time of transit of an automobile 200 and the load of a fuel cell 10 may be supported by the feeding-and-discarding members 40, such as a fuel.

[0064] As explained above, since it is attached as 1 rigidity object, a fuel cell 10 can be easily carried in an automobile 200, and can be considered as a secret-intention object also to the vibration at the time of transit of an automobile 200. Moreover, since it attached so that the load of a fuel cell 10 might be supported by the feeding-and-discarding members 40, such as a fuel, stress given to the bolt which the feeding-and-discarding members 40, such as a fuel, do not vibrate greatly by vibration at the time of transit of an automobile 200, and is used for connecting piping or connection can be made small. Consequently, sufficient seal nature for a connection is obtained and leakage of fuel gas, cooling water, etc. can be prevented. Furthermore, since the fuel cell 10 was installed in the bottom of a backseat 240, having used the direction of a laminating of layered products 12A-12D as horizontal, habitation space in an automobile 200 can be enlarged. In addition, in the example, although the fuel cell 10 was carried in the automobile 200, you may carry in migration cars other than an automobile. Moreover, the configuration which is not carried in a migration car does not interfere, either.

[0065] Next, the fuel cell 310 which is the 2nd example of this invention is explained. Drawing 21 is an explanatory view which illustrates the outline of the fuel cell 310 of the 2nd example. A fuel cell 310 consists of a stowage container 380 which contains the feeding-and-discarding members 340, such as the feeding-and-discarding member 340, and layered products 312A-312D, fuels, such as a fuel which performs feeding and discarding, such as a fuel to four layered products 312A-312D which carry

out the laminating of the cell and become, and these layered products 312A-312D, and a pressurization device 110 in which the pressure of the direction of a laminating is applied to layered products 312A-312D so that it may illustrate. In addition, since the pressurization device 110 of the 2nd example is the same configuration as the pressurization device 110 with which the fuel cell 10 of the 1st example is equipped, it attaches the same sign and omits the explanation.

[0066] Drawing 22 is a perspective view which illustrates the outline of the configuration of the cell 313 which constitutes layered products 312A-312D, and the cooling member 330. A cell 313 is a cell of a polymer electrolyte fuel cell, and it consists of an electrolyte membrane 314, two gas diffusion electrodes 316 which form sandwich structure on both sides of this electrolyte membrane 314 from both sides, and two collectors 320 which pinch this sandwich structure from both sides so that it may illustrate.

[0067] The electrolyte membrane 314 and the gas diffusion electrode 316 are formed from the same ingredient (about polymeric materials and a gas diffusion electrode 316, it is [electrolyte membrane / 314] a carbon cross) as the electrolyte membrane 14 of the 1st example, and a gas diffusion electrode 16, and are joined by the same approach (hot pressing).

[0068] The laminating side is formed in the sheet metal of the shape of a rectangle a little with the vertical direction longer than the longitudinal direction in drawing 22 R> 2 with the substantia-compacta carbon which is the ingredient as the collector 20 of the 1st example with the same collector 320. Along with the upper limb or margo inferior of a collector 320, the long and slender through tube (cooling water hole 321,322) is formed in the drawing Nakagami section right-hand side and the lower left of this laminating side. When this cooling water hole 321,322 forms a layered product, it forms the passage of the cooling water which penetrates a layered product in the direction of a laminating. Moreover, the through tube (the fuel gas hole 323,324 and oxidation gas eye 325,326) of a rectangular equilateral triangle is formed in this laminating side for the cross section. When this fuel gas hole 323,324 and the oxidation gas eye 325,326 form a layered product, they form the passage which penetrates the layered product of fuel gas and oxidation gas in the direction of a laminating.

[0069] Two or more parallel slots 327 which connect between the fuel gas holes 323,324 located in a vertical angle are formed in one side (rear face in drawing) of the laminating side of a collector 320, and the oxidation gas eye 25 located in another vertical angle and the slot 328 which connects between 26 are formed in another side

(screen in drawing) of a laminating side. This slot 327 and slot 328 lie at right angles, and the passage of oxidation gas or fuel gas is made on the front face of a gas diffusion electrode 316, respectively. In addition, a collector 320 is arranged so that a slot 327 and a slot 328 may confront each other on both sides of an electrolyte membrane 314 and a gas diffusion electrode 316.

[0070] It is formed with substantia-compacta carbon as well as [the cooling member 330] a collector 320. The cooling water holes 331 and 332, the fuel gas hole 333,334, and the oxidation gas eye 335,336 of the same configuration are formed in the same location as the cooling water holes 321 and 322, the fuel gas hole 323,324, and the oxidation gas eye 325,326 which were formed in the laminating side of a collector 320 in the laminating side of the cooling member 330. The cooling water hole 331,332 forms the passage of cooling water with the cooling water hole 321,322 of a collector 320, and the fuel gas hole 333,334 and the oxidation gas eye 335,336 form the passage of fuel gas and oxidation gas with the fuel gas hole 323,324 and the oxidation gas eye 325,326 of a collector 320. Moreover, the meandering slot 338 from the cooling water hole 331 to the cooling water hole 332 is formed in one side (screen in drawing) of the laminating side of the cooling member 330 with the rib 337. This slot 338 forms the path of cooling water in respect of the laminating in which the slot on the collector (not shown) in which either a slot 327 or the slot 328 is not formed is not formed.

[0071] In this way, the laminating of the cooling member 330 is carried out to the constituted cell 313, and layered products 312A-312D are formed. Also in the second example, the laminating of a cell 313 and the cooling member 330 was carried out as a ratio of 3:1, and layered products 312A-312D were formed.

[0072] Drawing 23 is a perspective view which illustrates a general view of the feeding-and-discarding members 340, such as a fuel. The explanatory view in which drawing 24 illustrated the passage for supply and the passage for discharge of fuel gas of the feeding-and-discarding members 340, such as a fuel, the explanatory view in which drawing 25 illustrated the passage for supply and the passage for discharge of oxidation gas of the feeding-and-discarding members 340, such as a fuel, and drawing 26 are the explanatory views which illustrated the passage for supply and the passage for discharge of the cooling water of the feeding-and-discarding member 340, such as a fuel.

[0073] The feeding-and-discarding members 340, such as a fuel, are formed in the rectangular parallelepiped configuration of aluminum. The feeding-and-discarding members 340, such as this fuel, like the feeding-and-discarding members 40, such as a fuel of the 1st example While supplying the fuel gas, oxidation gas, and cooling water

from the fuel gas feeding-and-discarding equipment which is not illustrated, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment to layered products 312A-312D It is the member which returns the exhaust gas and cooling water by the side of the exhaust gas by the side of the fuel gas discharged from layered products 312A-312D, and oxidation gas to fuel gas feeding-and-discarding equipment, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment. For this reason, the passage for the feeding and discarding of the cooling water which connects the passage and the cooling water feeding-and-discarding equipment, and each layered products 312A-312D for the feeding and discarding of the oxidation gas which connects the passage, the oxidation gas feeding-and-discarding equipment, and each layered products 312A-312D for the feeding and discarding of the fuel gas which connects the fuel gas feeding-and-discarding equipment explained below and each layered products 312A-312D is formed in the feeding-and-discarding members 340, such as a fuel.

[0074] When two collectors 320 are put in order so that the cooling water hole 321 may become with the upper part both sides of the feeding-and-discarding members 340, such as a fuel, and the feeding-and-discarding members 340, such as a fuel, are made to adjust them as shown in the feeding-and-discarding members 340, such as a fuel, at drawing 23 thru/or drawing 26 , The cooling water holes 321 and 322, the fuel gas hole 323,324 and the oxidation gas eye 325,326 which were formed in the laminating side of two collectors 320, and the cooling water holes 364A, 364B, 366A, and 366B, the fuel gas holes 344A, 344B, 346A, and 346B to adjust And the oxidation gas eyes 354A, 354B, 356A, and 356B are formed. moreover, in the drawing 23 Nakagami side of the feeding-and-discarding member 340, a fuel etc. The feed holes 341,351,361 which are connected to the fuel gas feeding-and-discarding equipment, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment which are not illustrated, and receive supply of fuel gas, oxidation gas, and cooling water are formed. In a drawing 23 R>3 Nakashita side (rear face), as shown in drawing 24 thru/or drawing 26 The discharge hole 349,359,369 which is connected to fuel gas feeding-and-discarding equipment, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment, and discharges the exhaust gas of a fuel gas system, the exhaust gas of an oxidation gas system, and cooling water to fuel gas feeding-and-discarding equipment, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment is formed.

[0075] As shown in drawing 24 , feed holes 341 are connecting with the fuel gas holes

344A and 344B by the fuel gas feeder current ways 342A and 342B, and are connecting the discharge hole 349 with the fuel gas holes 346A and 346B by the fuel gas outflow way 347. Therefore, while the feeding-and-discarding members 340, such as a fuel, supply the fuel gas from fuel gas feeding-and-discarding equipment to layered products 312A-312D through feed holes 341, the fuel gas feeder current ways 342A and 342B, and the fuel gas holes 344A and 344B The exhaust gas of the fuel gas system discharged from layered products 312A-312D is discharged to fuel gas feeding-and-discarding equipment through the fuel gas holes 346A and 346B, the fuel gas outflow way 347, and a discharge hole 349.

[0076] Moreover, as shown in drawing 25 , the feed holes 351 of the feeding-and-discarding members 340, such as a fuel, are connecting with the oxidation gas eyes 354A and 354B by the oxidation gas supply passage 352, and are connecting the discharge hole 359 with the oxidation gas eyes 356A and 356B by the oxidation gas outflow ways 357A and 357B. Therefore, while the feeding-and-discarding members 340, such as a fuel, supply the oxidation gas from oxidation gas feeding-and-discarding equipment to layered products 312A-312D through feed holes 351, the oxidation gas supply passage 352, and the oxidation gas eyes 354A and 354B The exhaust gas of the oxidation gas system discharged from layered products 312A-312D is discharged to oxidation gas feeding-and-discarding equipment through the oxidation gas eyes 356A and 356B, the oxidation gas outflow ways 357A and 357B, and a discharge hole 359.

[0077] As shown in drawing 26 , the feed holes 361 of the feeding-and-discarding members 340, such as a fuel, are connecting with the cooling water holes 364A and 364B by the cooling water feeder current ways 362A and 362B, and are connecting the discharge hole 369 with the cooling water holes 366A and 366B by the cooling water outflow ways 367A and 367B. Therefore, while the feeding-and-discarding members 340, such as a fuel, supply the cooling water from cooling water feeding-and-discarding equipment to layered products 312A-312D through feed holes 361, the cooling water feeder current ways 362A and 362B, and the cooling water holes 364A and 364B The cooling water discharged from layered products 312A-312D is discharged to cooling water feeding-and-discarding equipment through the cooling water holes 366A and 366B, the cooling water outflow ways 367A and 367B, and a discharge hole 369.

[0078] In this way, since order and right and left are formed in the symmetry, the feeding-and-discarding members 340, such as a constituted fuel, can supply equally fuel gas, oxidation gas, and cooling water to layered products 312A-312D.

[0079] Next, the stowage container 380 which contains the feeding-and-discarding members 340, such as such a fuel, and layered products 312A-312D is explained. Drawing 27 is the sectional view which disconnected the fuel cell 310 shown in drawing 21 in the J-J cross section. As shown in drawing 21 and drawing 27 , the stowage container 380 is carrying out box-like [rectangular], and is constituted by the top cover 381, the stowage 391 which contains layered products 312A-312D, and the pressurization device 110 attached in the both ends of a stowage 391.
[0080] Inside [lower central] the stowage 391, the rib 392 which met in the directions of a laminating, such as layered product 312A, is bent and formed. The part in which this rib 392 is equivalent to the location in which the feeding-and-discarding members 340, such as a fuel, are attached is cut off. Moreover, two parallel supporters 394A and 394B which met in the directions of a laminating, such as layered product 312A, are formed in each field along laminating sides, such as layered product 312A of a stowage 391, and the same supporters 394A and 394B also as a rib 392 are formed. To the contact side of layered product 312A of these supporters 394A and 394B etc. What performed processing which becomes small [frictional resistance] by insulation with the quality of the material or insulation with small frictional resistance when it is made to move where the field which met in the directions of a laminating, such as layered product 312A, is contacted (For example) The frictional resistance reduction member 398 formed of what applied fluorine system grease etc. is attached in the harder front faces, such as a fluororubber, natural rubber, a styrene rubber, isobutylene isoprene rubber, ethylene rubber, ethylene propylene rubber, high PARON, and silicone rubber. Moreover, the flange 396 which attaches a top cover 381 is formed in the upper part of a stowage 391.
[0081] Also inside [central] the upper part 81, the rib 382 which met in the directions of a laminating, such as layered product 312A, is bent and formed. The part in which this rib 382 is also equivalent to the location in which the feeding-and-discarding members 340, such as a fuel, are attached is cut off. Moreover, two parallel supporters 384A and 384B which met in the directions of a laminating, such as layered product 312A, are formed also in the field along laminating sides, such as layered product 312A of a top cover 381, and the frictional resistance reduction member 398 is attached in the contact side of layered product 312A of these supporters 384A and 384B etc. The flange 396 of a stowage 391 and the flange 386 to adjust are formed in the edge of a top cover 381, and it can attach in a stowage 391 with the bolt which is not illustrated.
[0082] In addition, the pressurization device 110 is attached in the both ends of the longitudinal direction of this stowage container 380, respectively, and the layered

products 312A-312D contained to the stowage container 380 according to the pressurization device 110 can be pressurized in the direction of a laminating.

[0083] Next, layered product 312A etc. is explained to a stowage container 380 based on drawing 28 about signs that a laminating is carried out. Drawing 28 is an explanatory view explaining signs that the laminating of the layered product 312A etc. is carried out to the stowage 391 of a stowage container 380. First, the feeding-and-discarding members 340, such as a fuel, are installed in the center of a stowage 391, and as shown in drawing 28 (a), since level, a stowage 391 is leaned a little. In such the condition, the laminating of a cell 313 and the cooling member 30 is carried out to the slanting upper part of the feeding-and-discarding members 340, such as a fuel. At this time, since the supporters 394A and 394B of a stowage 391 guide cell 313 grade, as for cell 313 grade, positioning is made easily. Moreover, since the frictional resistance reduction member 398 is attached in Supporters 394A and 394B, a laminating can be carried out tidily, without producing a clearance between the adjoining cells 313.

[0084] In this way, if the laminating of the cell 313 of a predetermined number is carried out to the slanting upper part of the feeding-and-discarding members 340, such as a fuel, the pressurization device 110 will be attached in the edge of the direction in which the layered product of a stowage 391 was formed, a layered product will be pressurized slightly, and eye tacking will be performed. Since the formed layered product is supported through the stowage 391 and the frictional resistance reduction member 398, eye tacking by the pressurization device 110 is also performed smoothly.

[0085] Next, as shown in drawing 28 (b), a stowage 391 is leaned so that the direction in which the layered product was formed may turn into a slanting lower part, and the laminating of the cell 313 grade is similarly carried out to the slanting upper part of the feeding-and-discarding members 340, such as a fuel. And the pressurization device 110 is attached, and the laminating one end is pressurized slightly and it carries out [tacking] to it.

[0086] Then, it pressurizes so that the cell 313 which carried out the laminating of the layered products 312A-312D formed in the both sides of the feeding-and-discarding members 340, such as a fuel, according to the pressurization device 110 may become predetermined planar pressure. The midst of this pressurization is pressurized so that the pressure which joins the layered products 312A-312D of the both sides of the feeding-and-discarding members 340, such as a fuel, may become as equal as possible. Since layered products 312A-312D are supported through the stowage 391

and the frictional resistance reduction member 398, they are pressurized smoothly, and the planar pressure which acts on each cell 313 in a layered product also becomes homogeneity. Next, a top cover 381 is attached in a stowage 391, and a fuel cell 310 is completed.

[0087] If the fuel gas feeding-and-discarding equipment, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment which are not illustrated are connected to the feeding-and-discarding members 340, such as a fuel of the fuel cell 310 constituted by each such configuration member, and fuel gas, oxidation gas, and cooling water are supplied, a fuel cell 310 will perform electrochemical reaction mentioned above, and will change chemical energy into direct electrical energy.

[0088] According to the fuel cell 310 of the 2nd example explained above, since the frictional resistance reduction member 398 was installed in the supporters 394A and 394B of the layered products 312A-312D of a stowage 391, a layered product can be easily attached with high precision to a stowage 391. Moreover, when a predetermined pressure is applied to layered products 312A-312D, since each cell 313 with which layered products 312A-312D are smoothly pressurized, and form layered products 312A-312D serves as uniform planar pressure, it can be made into the highly precise fuel cell 310 smaller than that of variation. Furthermore, since the feeding-and-discarding members 340, such as a fuel, were installed in the center section of the really formed stowage 391, a stowage 391 does not need to take charge of the tension pressure by the pressurization device 110, and it does not need to fix the feeding-and-discarding members 340, such as a fuel, to a stowage 391.

[0089] From the first, for the feeding and discarding of the fuel gas to each layered products 312A-312D, oxidation gas, and cooling water, that what is necessary is just to connect the feeding-and-discarding member 340 and fuel gas feeding-and-discarding equipments, such as a fuel, oxidation gas feeding-and-discarding equipment, and cooling water feeding-and-discarding equipment, as compared with a fuel cell to be connected, a connection place and connecting piping can be lessened for every layered product, and the installation tooth space of a fuel cell 310 can be made small. Moreover, since the feeding-and-discarding member 340 and four layered products 312A-312D, such as a fuel, are unified and it considers as 1 rigidity object, a fuel cell 310 can be easily installed in a car etc. Since the feeding-and-discarding members 340, such as a fuel, are pinched by layered products 312A-312D and a pressure is applied according to the pressurization device 110 from the other end, sufficient seal nature for the

contact surface of the feeding-and-discarding members 340, such as a fuel, and layered products 312A-312D is securable. Furthermore, since the exhaust gas of a fuel gas system etc. can be equally discharged from each layered products 312A-312D to the feeding-and-discarding members 340, such as a fuel, while supplying fuel gas etc. to each layered products 312A-312D equally from the feeding-and-discarding members 340, such as a fuel, each layered products 312A-312D can be operated on the same conditions, and it can consider as a fuel cell with sufficient operation effectiveness.

[0090] With the fuel cell 310 of the 2nd example, although the frictional resistance reduction member 398 was installed in the supporters 394A and 394B of a stowage 391, Supporters 394A and 394B may be formed by the frictional resistance reduction member.

[0091] Although chisels, such as a hole required for feeding and discarding, such as fuel gas, were formed in the feeding-and-discarding members 340, such as a fuel, in the fuel cell 310 of the 2nd example, in order to lightweight-ize feeding-and-discarding members, such as a fuel, the configuration which forms Holes 371A and 371B and Holes 372A-378A, and 372B-378B in the center of the contact surface of the part in contact with layered products 312A-312D is also suitable like feeding-and-discarding member 340B, such as a fuel illustrated to drawing 29 . In addition, the configuration of the hole for lightweight-izing of it not being what is restricted to the holes 371A and 372A illustrated to drawing 29 is natural.

[0092] In the fuel cell 310 of the 2nd example, although the feeding-and-discarding members 340, such as a fuel, were formed by aluminum, you may form with thermoplastics, such as thermosetting plastic, such as other metals and various kinds of alloys, such as iron, phenol resin, melamine resin, an unsaturated polyester resin, an epoxy resin, and silicone resin, a fluororesin and tetrafluoroethylene resin, a polycarbonate, polyphenylene sulfide, and polyphenylene ether, etc. If the feeding-and-discarding members 340, such as a fuel, are formed by resin etc., since the feeding-and-discarding members 340, such as a fuel, insulate, it is not necessary to form an electric insulating plate in the feeding-and-discarding member 340 side, such as a fuel of layered products 312A-312D.

[0093] Although the feeding-and-discarding members 340, such as a fuel, were installed in the center section of the really formed stowage 391 in the fuel cell 310 of the 2nd example, it is good also as a configuration which attaches the upper housing 80 and lower housing 90 which were separated like the fuel cell 10 of the 1st example in the feeding-and-discarding members 340, such as a fuel. In this case, the member

442 formed of aluminum in feeding-and-discarding members, such as a fuel, like feeding-and-discarding member 340C, such as a fuel shown in drawing 30 , and the member 444,446 formed with the resin which pinches this are joined and formed. While being able to obtain bigger reinforcement than the case where the thing which attaches upper housing 80 and lower housing 90 in a member 442 then upper housing 80, and lower housing 90 are attached in resin, it can also have insulation with layered products 312A-312D.

[0094] Although the example of this invention was explained above, as for this invention, it is needless to say that it can carry out in the mode which becomes various within limits which are not limited to such an example at all and do not deviate from the summary of this invention.

[0095]

[Effect of the Invention] Since the fuel feeding-and-discarding member pinched by two or more layered products performs the feeding and discarding of a fuel system to two or more layered products from the hole prepared in the contact section with two or more of these layered products according to the fuel cell of this invention as explained above, it is not necessary to make connection with fuel feeding-and-discarding equipment for every layered product that what is necessary is just to connect to a fuel feeding-and-discarding member the fuel feeding-and-discarding equipment and the fuel feeding-and-discarding member which perform the feeding and discarding of a fuel system. For this reason, coupling parts, such as connecting piping, can be lessened and can be attached easily.

[0096] According to the fuel cell according to claim 2, a fuel feeding-and-discarding member can perform the feeding and discarding of the fuel system of a layered product using the feeding-and-discarding passage of the fuel system of the direction of a laminating of a layered product, and a fuel cell can be made small.

[0097] According to the fuel cell according to claim 3, since a fuel feeding-and-discarding member and a layered product are fixed as 1 rigidity object, a fuel cell can be dealt with as a secret-intention object. Therefore, when it carries a fuel cell in migration cars, such as an automobile, it is not necessary to also perform installation for every layered product that what is necessary is just to also take the behavior into consideration as a secret-intention object.

[0098] According to the fuel cell according to claim 4, since the fuel feeding-and-discarding member is pinched by two or more layered products, even if it pressurizes a layered product in the direction of a laminating with a pressurization means, near the laminating edge of a layered product swells by the pressure by the

pressurization means, or it does not curve. Moreover, since a layered product is pressurized in the direction of a laminating with a pressurization means, seal nature between a fuel feeding-and-discarding member and a layered product can be made high, and leakage of a fuel etc. can be prevented. Furthermore, since it pressurizes for every layered product, the pressure applied for every layered product can be adjusted, and it can maintain for every layered product.

[0099] Since the electric polarity of the laminating edge of the layered product which confronts each other on both sides of a fuel feeding-and-discarding member shall be differed according to the fuel cell according to claim 5, the layered product which confronts each other on both sides of a fuel cell is electrically connectable with a serial easily.

[0100] According to the fuel cell according to claim 6, with the frictional resistance reduction means formed in a part of contact surface with the holddown member of a layered product, or contact surface [at least] with the layered product of a holddown member, since the frictional resistance committed in the contact section of a layered product or the contact section of a holddown member becomes small in case a layered product is moved, where a holddown member is contacted, installation of the layered product to a holddown member can be made smooth, and a layered product can be attached more to a precision. Moreover, since the frictional resistance at the time of moving a layered product where a holddown member is contacted is small when it has a pressurization means, a layered product can be pressurized more equally and the engine performance of a fuel cell can be raised more.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the explanatory view which illustrates the outline of the fuel cell 10 which is one example of this invention.
[Drawing 2] It is the perspective view which illustrates the outline of the cell 13 which constitutes layered products 12A-12D, and the cooling member 30.
[Drawing 3] It is the perspective view which illustrates a general view of the feeding-and-discarding members 40, such as a fuel.
[Drawing 4] It is the explanatory view which illustrates the passage for supply of the fuel gas of the feeding-and-discarding members 40, such as a fuel.
[Drawing 5] It is the explanatory view which illustrates the passage for discharge of the fuel gas of the feeding-and-discarding members 40, such as a fuel.
[Drawing 6] It is the explanatory view which illustrates the passage for supply and the passage for discharge of oxidation gas of the feeding-and-discarding members 40, such as a fuel.
[Drawing 7] The fuel shown in drawing 3 is the A-A line sectional view of the feeding-and-discarding member 40.
[Drawing 8] The fuel shown in drawing 3 is the B-B line sectional view of the feeding-and-discarding member 40.
[Drawing 9] The fuel shown in drawing 3 is the C-C line sectional view of the feeding-and-discarding member 40.
[Drawing 10] The fuel shown in drawing 3 is D-D line sectional view of the feeding-and-discarding member 40.
[Drawing 11] It is the E-E line sectional view of the upper housing 80 shown in drawing 1.
[Drawing 12] It is the F-F line sectional view of the upper housing 80 shown in drawing

1 .

[Drawing 13] It is the G-G line sectional view of the lower housing 90 shown in drawing 1 .

[Drawing 14] It is the H-H line sectional view of the lower housing 90 shown in drawing 1 .

[Drawing 15] It is the explanatory view which illustrates signs that layered product 12A and layered product 12C are connected.

[Drawing 16] It is the explanatory view which illustrates signs that layered product 12C and layered product 12D are connected.

[Drawing 17] It is the explanatory view which illustrates the configuration of the pressurization device 110.

[Drawing 18] It is the explanatory view which illustrates the outline of the rotation prevention member 120.

[Drawing 19] It is the explanatory view which illustrates the outline of the pressurization member 130.

[Drawing 20] It is the explanatory view showing an example of the arrangement at the time of carrying fuel cell 10 grade in an automobile 200.

[Drawing 21] It is the explanatory view which illustrates the outline of the fuel cell 310 of the 2nd example.

[Drawing 22] It is the perspective view which illustrates the outline of the cell 313 which constitutes layered products 312A-312D, and the cooling member 330.

[Drawing 23] It is the perspective view which illustrates a general view of the feeding-and-discarding members 340, such as a fuel of the 2nd example.

[Drawing 24] It is the explanatory view which illustrates the passage for supply and the passage for discharge of fuel gas of the feeding-and-discarding members 340, such as a fuel.

[Drawing 25] It is the explanatory view which illustrates the passage for supply and the passage for discharge of oxidation gas of the feeding-and-discarding members 340, such as a fuel.

[Drawing 26] It is the explanatory view which illustrates the passage for supply and the passage for discharge of the cooling water of the feeding-and-discarding member 340, such as a fuel.

[Drawing 27] It is the J-J line sectional view of the fuel cell 310 shown in drawing 21 .

[Drawing 28] It is an explanatory view explaining signs that the laminating of the layered product 312A etc. is carried out to the stowage 391 of a stowage container 380.

[Drawing 29] It is the explanatory view which illustrates the outline of feeding-and-discarding member 340B, such as fuels which are the modifications of the feeding-and-discarding member 340, such as a fuel of the 2nd example.
[Drawing 30] It is the perspective view which illustrates a general view of feeding-and-discarding member 340C, such as fuels which are the modifications of the feeding-and-discarding member 340, such as a fuel of the 2nd example.
[Description of Notations]
10 — Fuel cell
12A-12D — Layered product
13 — Cell
14 — Electrolyte membrane
16 — Gas diffusion electrode
20 — Collector
21 22 — Cooling water hole
23 24 — Fuel gas hole
25 26 — Oxidation gas eye
27 28 — Slot
30 — Cooling member
31 32 — Cooling water hole
33 34 — Fuel gas hole
35 36 — Oxidation gas eye
37 — Rib
38 — Slot
40 — Feeding-and-discarding members, such as a fuel
42A-42D — Cooling water feed hopper
43A-43D — Cooling water supply path
44A-44D — Cooling water supply end connection
46A-46D — Cooling water exhaust port
47A-47D — Cooling water discharge path
48A-48D — Cooling water discharge end connection
50 — Fuel gas feed hopper
51 — Fuel gas feeder current way
52 — Fuel gas communication passage
52A — Fuel gas passage formation member
53 — Cutting hole
54 — Fuel gas distribution room

54A -- Fuel gas distribution room formation member
56 -- Cutting hole
57 -- Fuel gas outflow way
57A -- Fuel gas outflow way formation member
58 -- Fuel gas discharge communication passage
59 -- Fuel gas exhaust port
62A-62D -- Fuel gas supply end connection
63A-63D -- Fuel gas supply path
64A-64D -- Fuel gas discharge end connection
65A-65D -- Fuel gas discharge path
70 -- Oxidation gas distribution slot
71A-71D -- Oxidation gas supply opening
72A-72D -- Oxidation gas supply end connection
73A-73D -- Oxidation gas supply path
74A-74D -- Oxidation gas discharge end connection
75A-75D -- Oxidation gas discharge path
76A-76D -- Oxidation gas exhaust
78 -- Oxidation gas discharge section
80 -- Upper housing
81 -- Upper part
82 -- Flank
84 -- Rib section
85 -- Guide section
86 -- Bend
87 -- Guide section
90 -- Lower housing
91 -- Pars basilaris ossis occipitalis
92 -- Flank
94, 96, 98 -- Bend
99 -- Terminal hole
100 -- Terminal
102 -- Connection plate
104 -- Engagement section
106 -- Terminal assembly
107 -- Engagement heights
108 -- Terminal assembly

109 — Engagement crevice
110 — Pressurization device
112 — Tie-down plate
114 — Through tube
120 — Rotation prevention member
122 — Plinth section
124 — Fitting section
126 — Through tube
130 — Pressurization member
132 — Disk
134 — Pressurization rib
136 — Pressurization shaft
138 — Pressurization crevice
140 — Pressurization bolt
142 — Edge
144 — Screw-thread-fornation section
146 — Edge
200 — Automobile
210,212 — Inverter
214 — Motor
220 — Fuel tank
222 — Methanol reformer
224 — Cooling water tank
226 — Humidifier
228 — Radiator
240 — Backseat
310 — Fuel cell
312A-312D — Layered product
313 — Cell
314 — Electrolyte membrane
316 — Gas diffusion electrode
320 — Collector
321,322 — Cooling water hole
323,324 — Fuel gas hole
325,326 — Oxidation gas eye
327,328 — Slot

330 -- Cooling member
331,332 -- Cooling water hole
333,334 -- Fuel gas hole
335,336 -- Oxidation gas eye
337 -- Rib
338 -- Slot
340 -- Feeding-and-discarding members, such as a fuel
340B -- Feeding-and-discarding members, such as a fuel
340C -- Feeding-and-discarding members, such as a fuel
341,351,361 -- Feed holes
342A, 342B -- Fuel gas feeder current way
344A, 344B, 346A, 346B -- Fuel gas hole
347 -- Fuel gas outflow way
349,359,369 -- Discharge hole
352 -- Oxidation gas supply passage
354A, 354B, 356A, 356B -- Oxidation gas eye
357A, 357B -- Oxidation gas outflow way
362A, 362B -- Cooling water feeder current way
364A, 364B, 366A, 366B -- Cooling water hole
367A, 367B -- Cooling water outflow way
371A, 371B -- Hole
372A-378A, 372B-378B -- Hole
380 -- Stowage container
381 -- Top cover
382 -- Rib
384A, 384B -- Supporter
386 -- Flange
391 -- Stowage
392 -- Rib
394A, 394B -- Supporter
396 -- Flange
398 -- Frictional resistance reduction member
442 -- Member
444,446 -- Member

[Translation done.]

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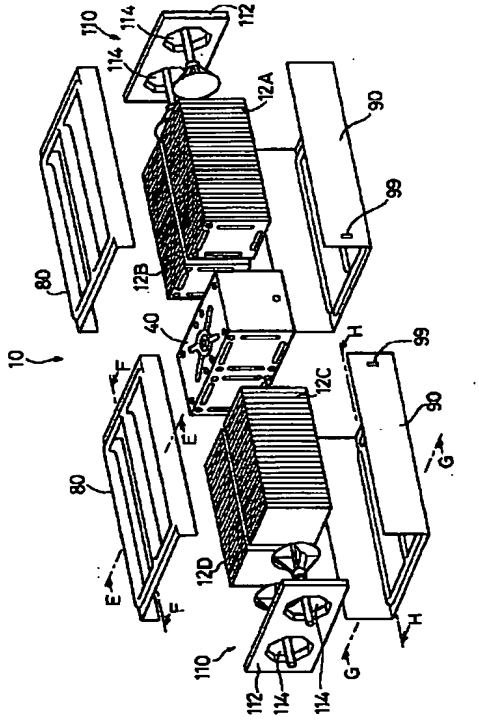
(54)【発明の名称】　燃料電池

(57)【要約】

【目的】　複数の積層体を備えた燃料電池において、各積層体に燃料等を均等に配流すると共に、取り付けを容易にし、小型化を図る。

【構成】　燃料電池１０は、燃料等の給排流路が積層方向に形成された積層体１２Ａ～１２Ｄと、積層体１２Ａ～１２Ｄに挟持されこの挟持面から積層体１２Ａ～１２Ｄに燃料等の給排を行なう燃料等給排部材４０と、積層体１２Ａ～１２Ｄの収納容器をなす上部ケース８０および下部ケース９０と、積層体１２Ａ～１２Ｄに積層方向の圧力を加える加圧機構１１０とから構成される。燃料等給排部材４０内の各積層体１２Ａ～１２Ｄへの給排流路は同一形状に形成されている。この結果、各積層体１２Ａ～１２Ｄに燃料等を均等に配流することができる。また、燃料等給排部材４０と燃料給排装置等を接続するだけでよく、取り付けが容易となり、小型化を図ることができる。



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【特許請求の範囲】

【請求項１】　単電池を積層してなる積層体を複数備えた燃料電池であって、

前記複数の積層体で挟持され、該複数の積層体に少なくとも燃料系の給排を行なう孔を該複数の積層体との接触部に設けた燃料給排部材を備えた燃料電池。

【請求項２】　前記複数の積層体の前記燃料給排部材との接触部が該積層体の積層端であり、該複数の積層体が積層方向の燃料系の給排流路を各々備えた請求項１記載の燃料電池。

【請求項３】　前記燃料給排部材と前記積層体とを一剛性体として固定する固定部材を備えた請求項１または２記載の燃料電池。

【請求項４】　前記複数の積層体の各々の前記燃料給排部材との接触端と反対側の積層端に設けられ、該複数の積層体を積層方向に各々加圧する加圧手段を備えた請求項２または３記載の燃料電池。

【請求項５】　前記燃料給排部材に接触する前記複数の積層体の各々の積層端の電気極性を、該燃料給排部材を挟んで対峙する積層体の積層端の電気極性と異なるよう該複数の積層体を配置してなる請求項２または３記載の燃料電池。

【請求項６】　前記積層体の前記固定部材との接触部または該固定部材の該積層体との接触部の少なくとも一部に、該積層体を該固定部材と接触した状態で移動させる際、該積層体の接触部または該固定部材の接触部に働く摩擦抵抗を小さくする摩擦抵抗低減手段を備えた請求項３記載の燃料電池。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、燃料電池に関し、詳しくは単電池を積層してなる積層体を複数備えた燃料電池に関する。

【０００２】

【従来の技術】燃料電池で行なわれる電気化学反応による単電池当たりの起電力は、例えば水素と酸素を燃料とする燃料電池では１．２３Ｖ（公称電圧）と低い。このため、通常、多数の単電池を積層して燃料電池が構成されている。こうした単電池を積層してなる燃料電池では、その積層の精度が内部抵抗として表われるから、所望の電力を得るのに必要な数の単電池をすべて積層して１つの積層体とするより、必要な数の単電池を複数に均等に分けて複数の積層体とし、この複数の積層体から得られる電力を電気的に直列に接続する方が、容易に積層の精度を高くすることができ、容易に内部抵抗の小さな燃料電池を得ることができる。

【０００３】また、所望の電力を得るのに必要な数の単電池をすべて積層して１つの積層体とすると、積層方向の長さが長くなり積層体を構成する各単電池に燃料等を均等に配流することが困難となる。この場合も、複数の

2

積層体とすれば、比較的容易に燃料を均等に配流し得るので、容易に効率の良い燃料電池を得ることができる。

【０００４】このような理由により、内部抵抗が小さく効率の良い燃料電池を容易に得るために、従来、複数の積層体からなる燃料電池として、２つの縦置きの積層体を並列に並べて上下の端板により固定するもの（例えば、特開平５－４７４０７号公報や特開平３－２０５７６６号公報等）や、４つの縦置きの積層体を並列に置いて上下の端板により固定するもの（例えば、特開平５－８９９０１号公報等）等が提案されている。

【０００５】

【発明が解決しようとする課題】しかしながら、こうした複数の積層体からなる燃料電池では、積層体毎に燃料等の給排を行なう必要があることから、燃料等の給排用の配管も積層体毎に設置しなければならず、給排用配管の取り付けが複雑となると共に、装置が大型化するという問題があった。

【０００６】この問題を解決するために、燃料等の給排に用いる流路を内部に備えた接続ユニットを積層体の積層端の一方に取り付けてなる燃料電池（例えば、特開平５－１０９４２５号公報等）も提案されているが、複数の積層体が各積層体に取り付けられた接続ユニットによりシリーズに接続されるので、各積層体に燃料等を均等に配流するのが困難になり、燃料電池の運転効率が低下するという問題があった。各積層体に燃料等が均等に配流されない燃料電池では、燃料等の圧力や供給量が積層体毎に異なるので、各積層体のすべてが好適な条件で運転されず、運転効率の低い積層体が生じて燃料電池全体としての運転効率を低下させる。

【０００７】また、この接続ユニットを用いる燃料電池では、複数の積層体が各積層体に取り付けられた接続ユニットによりシリーズに接続されているだけなので、車両等に搭載する場合、車両が生じる振動により積層体がズレて燃料ガスや冷却水等が漏れたり衝撃荷重による積層体を構成する部材が欠損する等の問題があった。こうした車両が生じる振動に基づく問題に対して、取付金具の一部を湾曲させて弾性変形を可能とする取付構造（例えば、特開平５－８２１５３号公報等）が提案されているが、積層体毎に取付金具による取り付けが必要であり、また、積層体間の間隔を振動の振幅以上にする必要があることから、燃料電池の設置に必要なスペースが大きくなるという問題があった。

【０００８】本発明の燃料電池は、こうした問題を解決し、各積層体に燃料等を均等に配流すると共に、取り付けを容易にし、小型化を図ることを目的とし、次の構成を採った。

【０００９】

【課題を解決するための手段】本発明の燃料電池は、単電池を積層してなる積層体を複数備えた燃料電池であって、前記複数の積層体で挟持され、該複数の積層体に少

なくとも燃料系の給排を行なう孔を該複数の積層体との接触部に設けた燃料給排部材を備えたことを要旨とする。

【0010】ここで、前記燃料電池において、前記複数の積層体の前記燃料給排部材との接触部が該積層体の積層端であり、該複数の積層体が各々積層方向の燃料系の給排流路を備えた構成とすることもできる。また、前記燃料電池において、前記燃料給排部材と前記積層体とを一剛性体として固定する固定部材を備えた構成とすることもできる。あるいは、前記燃料電池において、前記複数の積層体の各々の前記燃料給排部材との接触端と反対側の積層端に設けられ、該複数の積層体を積層方向に各々加圧する加圧手段を備えた構成とすることもできる。さらに、前記燃料電池において、前記燃料給排部材に接触する前記複数の積層体の各々の積層端の電気極性を、該燃料給排部材を挟んで対峙する積層体の積層端の電気極性と異なるよう該複数の積層体を配置してなる構成とすることもできる。あるいは、前記燃焼電池において、前記積層体の前記固定部材との接触部または該固定部材の該積層体との接触部の少なくとも一部に、該積層体を該固定部材と接触した状態で移動させる際、該積層体の接触部または該固定部材の接触部に働く摩擦抵抗を小さくする摩擦抵抗低減手段を備える構成とすることもできる。

【0011】

【作用】以上のように構成された本発明の燃料電池は、複数の積層体で挟持された燃料給排部材が、この複数の積層体との接触部に設けられた孔から複数の積層体に少なくとも燃料系の給排を行なう。この結果、積層体毎に燃料の給排用の配管を接続する必要がなく、燃料電池が小型になる。

【0012】請求項2記載の燃料電池では、燃料給排部材が、積層体の積層方向の燃料系の給排流路に積層体の積層端から燃料系の給排を行なう。

【0013】請求項3記載の燃料電池では、固定部材により燃料給排部材と積層体とを一剛性体として固定することにより、燃料電池を一剛性体として取り扱うことを可能とする。

【0014】請求項4記載の燃料電池では、加圧手段が、積層体の燃料給排部材との接触端と反対側の積層端から積層体を積層方向に加圧する。

【0015】請求項5記載の燃料電池では、燃料給排部材に接触する複数の積層体の各々の積層端の電気極性を異なる極性とすることにより、各積層体を容易に電気的に直列に接続することができる。

【0016】請求項6記載の燃料電池では、積層体の固定部材との接触面または固定部材の積層体との接触面の少なくとも一部に形成された摩擦抵抗低減手段が、積層体を固定部材と接触した状態で移動させる際、積層体の接触部または固定部材の接触部に働く摩擦抵抗を小さくする。

【0017】

【実施例】以上説明した本発明の構成・作用を一層明らかにするために、以下本発明の好適な実施例について説明する。図1は、本発明の好適な一実施例である燃料電池10の概略を例示する説明図である。

【0018】図示するように、燃料電池10は、単電池を積層してなる4つの積層体12A～12Dと、この積層体12A～12Dへの燃料等の給排を行なう燃料等給排部材40と、積層体12A～12Dの収納容器をなす上部ケース80および下部ケース90と、積層体12A～12Dに積層方向の圧力を加える加圧機構110とから構成される。以下各構成部材について説明する。

【0019】図2は、積層体12A～12Dとを構成する単電池13および冷却部材30の構成の概略を例示する斜視図である。単電池13は、固体高分子型燃料電池の単電池であり、図示するように、電解質膜14と、この電解質膜14を両側から挟んでサンドイッチ構造を形成する2つのガス拡散電極16と、このサンドイッチ構造を両側から挟持する2つの集電極20とから構成される。

【0020】電解質膜14は、高分子材料、例えば、フッ素系樹脂により形成された厚さ100μmないし200μmのイオン交換膜であり、湿潤状態で良好な電気伝導性を示す。2つのガス拡散電極16は、共に炭素繊維からなる糸で織成したカーボンクロスにより形成されている。このカーボンクロスの電解質膜14側の表面および隙間には、触媒としての白金または白金と他の金属からなる合金等を担持したカーボン粉が練り込まれている。この電解質膜14と2つのガス拡散電極16は、2つのガス拡散電極16が電解質膜14を挟んでサンドイッチ構造とした状態で、100℃ないし160℃好ましくは110℃ないし130℃の温度で、1MPa {10．2kgf／cm²} ないし20MPa {204kgf／cm²} 好ましくは8MPa {82kgf／cm²} ないし15MPa {153kgf／cm²} の圧力を作用させて接合するホットプレス法により接合されている。

【0021】集電極20は、カーボンを圧縮して緻密化しガス不透過とした緻密質カーボンにより形成されている。集電極20のガス拡散電極16と接触する面（積層面）は、正方形状に形成されており、この面の図中の上部両隅には、断面が円形の冷却水孔21，22が形成されている。この冷却水孔21，22は、積層体を形成した際、積層体を積層方向に貫通する冷却水の流路を形成する。また、集電極20の積層面の各辺の縁付近には、辺に沿って細長い一対の孔（燃料ガス孔）23，24および一対の孔（酸化ガス孔）25，26が形成されている。この燃料ガス孔23，24および酸化ガス孔25，26は、積層体を形成した際、水素を含有する燃料ガスおよび酸素を含有する酸化ガスの積層体を積層方向に貫

5

通する流路を形成する。

【００２２】集電極２０の積層面の一方（図中裏面）には、一対の燃料ガス孔２３，２４間を連絡する一対の酸化ガス孔２５，２６の長手方向と平行な複数の溝２７が形成されており、積層面の他方（図中表示面）には、一対の酸化ガス孔２５，２６間を連絡する溝２８が形成されている。この溝２７と溝２８とは直交しており、それぞれガス拡散電極１６の表面とで酸化ガスまたは燃料ガスの流路をなす。なお、電解質膜１４およびガス拡散電極１６を挟んで溝２７と溝２８とが対峙するよう集電極２０が配置される。

【００２３】冷却部材３０は、集電極２０と同様の緻密質カーボンにより形成されている。冷却部材３０の積層面には、集電極２０の積層面に形成された冷却水孔２１，２２，燃料ガス孔２３，２４および酸化ガス孔２５，２６と同一の場所に同一形状の冷却水孔３１，３２，燃料ガス孔３３，３４および酸化ガス孔３５，３６が形成されている。冷却水孔３１，３２は集電極２０の冷却水孔２１，２２と共に冷却水の流路を形成し、燃料ガス孔３３，３４および酸化ガス孔３５，３６は、集電極２０の燃料ガス孔２３，２４および酸化ガス孔２５，２６と共に燃料ガスおよび酸化ガスの流路を形成する。また、冷却部材３０の積層面の一方（図中表示面）には、冷却水孔３１から冷却水孔３２に至る葛折状の溝３８がリブ３７により形成されている。この溝３８は、溝２７または溝２８のいずれかが形成されていない集電極（図示せず）の溝が形成されていない積層面とで冷却水の通路を形成する。

【００２４】こうして構成された単電池１３と冷却部材３０を積層して積層体１２Ａ～１２Ｄを形成する。この際、単電池１３と冷却部材３０との積層体中の比率は、単電池１３の発熱量，冷却水の温度，冷却水の流量などの条件により定まる。実施例では、単電池１３と冷却部材３０とを３：１の比率で積層して積層体１２Ａ～１２Ｄを形成した。

【００２５】図３は、燃料等給排部材４０の概観を例示する斜視図である。図４は燃料等給排部材４０の燃料ガスの供給用流路を例示した説明図、図５は燃料等給排部材４０の燃料ガスの排出用流路を例示した説明図、図６は燃料等給排部材４０の酸化ガスの供給用流路および排出用流路を例示した説明図である。また、図７，図８，図９および図１０は、図３に示した燃料等給排部材４０のＡ－Ａ線断面図，Ｂ－Ｂ線断面図，Ｃ－Ｃ線断面図およびＤ－Ｄ線断面図である。

【００２６】燃料等給排部材４０は、アルミニウムにより直方体形状に形成されている。この燃料等給排部材４０は、図示しない燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置からの燃料ガス，酸化ガスおよび冷却水を積層体１２Ａ～１２Ｄに供給すると共に、積層体１２Ａ～１２Ｄから排出される燃料ガス側の排ガス，

6

酸化ガス側の排ガスおよび冷却水を燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置に戻す部材である。このため、燃料等給排部材４０には、以下に説明する燃料ガス給排装置と各積層体１２Ａ～１２Ｄとを連絡する燃料ガスの給排のための流路，酸化ガス給排装置と各積層体１２Ａ～１２Ｄとを連絡する酸化ガスの給排のための流路および冷却水給排装置と各積層体１２Ａ～１２Ｄとを連絡する冷却水の給排のための流路が形成されている。

【００２７】まず、冷却水の給排のための流路について説明する。燃料等給排部材４０の図３中の上面の中央の両サイドには、冷却水給排装置から冷却水の供給を受ける冷却水供給口４２Ａ～４２Ｄが形成されており、同面の四隅には、冷却水給排装置へ冷却水を戻す冷却水排出口４６Ａ～４６Ｄが形成されている。また、燃料等給排部材４０の同図の右側面の上部中央には、冷却水給排装置からの冷却水を積層体１２Ａ，１２Ｂに供給する冷却水供給接続口４４Ａ，４４Ｂが形成されており、同面の上部両隅には、積層体１２Ａ，１２Ｂから排出される冷却水を受け入れる冷却水排出接続口４８Ａ，４８Ｂが形成されている。なお、この面（図３中の右側面）に対向する面（図１に示した燃料等給排部材４０の左側面）にも、この面と同様に冷却水供給接続口４４Ｃ，４４Ｄおよび冷却水排出接続口４８Ｃ，４８Ｄが形成されている。この冷却水供給口４２Ａ～４２Ｄと冷却水供給接続口４４Ａ～４４Ｄは、図１０に示す冷却水供給通路４３Ｂ，４３Ｄのように直角に折れた通路（冷却水供給通路）４３Ａ～４３Ｄにより連絡されている。また、冷却水排出口４６Ａ～４６Ｄと冷却水排出接続口４８Ａ～４８Ｄも、図７に例示する冷却水排出通路４７Ａ，４７Ｃのように直角に折れた通路（冷却水排出通路）４７Ａ～４７Ｄにより連絡されている。

【００２８】したがって、燃料等給排部材４０は、冷却水給排装置からの冷却水を冷却水供給口４２Ａ～４２Ｄ，冷却水供給通路４３Ａ～４３Ｄおよび冷却水供給接続口４４Ａ～４４Ｄを介して積層体１２Ａ～１２Ｄに供給すると共に、積層体１２Ａ～１２Ｄから排出される冷却水を冷却水排出接続口４８Ａ～４８Ｄ，冷却水排出通路４７Ａ～４７Ｄおよび冷却水排出口４６Ａ～４６Ｄを介して冷却水給排装置に戻す。

【００２９】次に燃料等給排部材４０の燃料ガスの給排のための流路について説明する。燃料等給排部材４０の図３中の右側面の中央には、燃料ガス給排装置からの燃料ガスを積層体１２Ａ，１２Ｂに供給する図中上下に細長い２つの燃料ガス供給接続口６２Ａ，６２Ｂが形成されており、同面の燃料ガス供給接続口６２Ａ，６２Ｂに対向する辺の縁付近には、積層体１２Ａ，１２Ｂから排出される燃料ガス側の排ガスを受け入れる２つの細長い燃料ガス排出接続口６４Ａ，６４Ｂが形成されている。なお、この面（図３中右側面）に対向する面（図１に示

した燃料等給排部材４０の左側面）にも、この面と同様の燃料ガス供給接続口６２Ｃ，６２Ｄおよび燃料ガス排出接続口６４Ｃ，６４Ｄが形成されている。

【００３０】図４に示すように、燃料等給排部材４０には、図中の右裏端面から図中の上面および右側面と平行で円形断面の燃料ガス供給流路５１と矩形断面の切削孔５３とが形成されている。この燃料ガス供給流路５１の図中の右裏端面に形成された燃料ガス供給口５０は、図示しない燃料ガス給排装置に接続される。切削孔５３には、切削孔５３と断面形状が同一でその長手方向の長さより短い燃料ガス分配室形成部材５４Ａが嵌挿されており、切削孔５３の最奥部に燃料ガス分配室５４が形成されている。また、燃料等給排部材４０には、図４中の上面（図９中の上縁）の中央から鉛直方向に燃料ガス供給流路５１と同一の円形断面の燃料ガス連絡流路５２が形成されている。この燃料ガス連絡流路５２には、図４中の上面から燃料ガス連絡流路５２と同一の断面形状をした燃料ガス流路形成部材５２Ａが嵌挿されている。また、燃料ガス供給流路５１は、先端部で燃料ガス分配室５４と接続しており、燃料ガス流路形成部材５２Ａの直下で燃料ガス供給流路５１と接続している。したがって、燃料ガス供給流路５１は、燃料ガス連絡流路５２により燃料ガス分配室５４に連絡される。燃料ガス分配室５４は、図１０に例示するように、燃料ガス分配室５４から燃料ガス供給接続口６２Ａ～６２Ｄに向けてその断面積が大きくなる燃料ガス供給通路６３Ａ～６３Ｄにより燃料ガス供給接続口６２Ａ～６２Ｄに連絡されている。

【００３１】また、図５に示すように、燃料等給排部材４０には、図中の右裏端面から、図中の上面および右側面と平行で略５角形断面の切削孔５６が形成されている。この切削孔５６には、切削孔５６と断面形状が同一でその長手方向の長さが短い燃料ガス排出流路形成部材５７Ａが図中の右裏端面から嵌挿されており、切削孔５６と燃料ガス排出流路形成部材５７Ａとで燃料ガス排出流路５７が形成されている。燃料ガス排出流路５７の図中の正面側の端面の最下部には、円形断面の燃料ガス排出連絡流路５８が形成されており、図中の正面に形成された燃料ガス排出口５９に連絡されている。燃料ガス排出口５９は、図示しない燃料ガス給排装置に接続される。燃料ガス排出流路５７は、図７に例示するように、燃料ガス排出流路５７から燃料ガス排出接続口６４Ａ～６４Ｄに向けてその断面積が大きくなる燃料ガス排出通路６５Ａ～６５Ｄにより燃料ガス排出接続口６４Ａ～６４Ｄに連絡されている。

【００３２】したがって、燃料等給排部材４０は、燃料ガス給排装置からの燃料ガスを燃料ガス供給口５０，燃料ガス供給流路５１，燃料ガス連絡流路５２，燃料ガス分配室５４，燃料ガス供給通路６３Ａ～６３Ｄおよび燃料ガス供給接続口６２Ａ～６２Ｄを介して積層体１２Ａ～１２Ｄに供給すると共に、積層体１２Ａ～１２Ｄから排出される燃料ガスの排ガスを燃料ガス排出接続口６４Ａ～６４Ｄ，燃料ガス排出通路６５Ａ～６５Ｄ，燃料ガス排出流路５７，燃料ガス排出連絡流路５８および燃料ガス排出口５９を介して燃料ガス給排装置に戻す。

【００３３】なお、燃料給排装置から各積層体１２Ａ～１２Ｄに至る燃料等給排部材４０に形成された燃料ガスの供給側の各流路（燃料ガス供給流路５１，燃料ガス連絡流路５２，燃料ガス分配室５４および燃料ガス供給通路６３Ａ～６３Ｄ）がそれぞれ同一形状をしており、各積層体１２Ａ～１２Ｄから燃料給排装置に至る燃料等給排部材４０に形成された燃料ガス側の排ガスの排出側の各流路（燃料ガス排出通路６５Ａ～６５Ｄ，燃料ガス排出流路５７，燃料ガス排出連絡流路５８および燃料ガス排出口５９）もそれぞれ同一形状をしているから、燃料等給排部材４０から各積層体１２Ａ～１２Ｄに燃料ガスが均等に供給され、各積層体１２Ａ～１２Ｄから燃料等給排部材４０へ燃料ガス側の排ガスが均等に排出される。

【００３４】次に燃料等給排部材４０の酸化ガスの給排のための流路について説明する。燃料等給排部材４０の図３中の上面の中央部には、円環状の溝と、この円環状の溝から四隅方向に向けて形成された４つの溝とからなる酸化ガス分配溝７０が形成されている。この酸化ガス分配溝７０の四隅方向に向けて形成された４つの溝の先端部には、断面が円形の酸化ガス供給口７１Ａ～７１Ｄが形成されている。この酸化ガス分配溝７０は、図示しない酸化ガス給排装置に接続される。燃料等給排部材４０の図中の右側面の上部には、酸化ガス給排装置からの酸化ガスを積層体１２Ａ，１２Ｂに供給する２つの細長い酸化ガス供給接続口７２Ａ，７２Ｂが形成されており、下部には積層体１２Ａ，１２Ｂから排出される酸化ガス側の排ガスを受け入れる２つの細長い酸化ガス排出接続口７４Ａ，７４Ｂが形成されている。なお、この面（図３中の右側面）に対向する面（図１に示した燃料等給排部材４０の左側面）にも、この面と同様の酸化ガス供給接続口７２Ｃ，７２Ｄおよび酸化ガス排出接続口７４Ｃ，７４Ｄが形成されている。

【００３５】図６および図８に示すように、酸化ガス供給口７１Ａ～７１Ｄは、酸化ガス供給口７１Ａ～７１Ｄから酸化ガス供給接続口７２Ａ～７２Ｄに向けて断面積が大きくなる酸化ガス供給通路７３Ａ～７３Ｄにより酸化ガス供給接続口７２Ａ～７２Ｄに連絡されている。

【００３６】また、燃料等給排部材４０の図６中の下裏面には、円形断面の凹部と、この凹部から四隅方向に向けて形成された４つの溝とからなる酸化ガス排出部７８が形成されている。この酸化ガス排出部７８の四隅方向に向けて形成された４つの溝の先端部には、断面が円形の酸化ガス排出口７６Ａ～７６Ｄが形成されている。酸化ガス排出口７６Ａ～７６Ｄは、図６および図８に示す

ように、酸化ガス排出口７６Ａ～７６Ｄから酸化ガス排出接続口７４Ａ～７４Ｄに向けて断面積が大きくなる酸化ガス排出通路７５Ａ～７５Ｄにより酸化ガス排出接続口７４Ａ～７４Ｄに連絡されている。

【００３７】したがって、燃料等給排部材４０は、酸化ガス給排装置からの酸化ガスを酸化ガス分配溝７０，酸化ガス供給口７１Ａ～７１Ｄ，酸化ガス供給通路７３Ａ～７３Ｄおよび酸化ガス供給接続口７２Ａ～７２Ｄを介して積層体１２Ａ～１２Ｄに供給すると共に、積層体１２Ａ～１２Ｄから排出される酸化ガスの排ガスを酸化ガス排出接続口７４Ａ～７４Ｄ，酸化ガス排出通路７５Ａ～７５Ｄ，酸化ガス排出口７６Ａ～７６Ｄおよび酸化ガス排出部７８を介して燃料ガス給排装置に戻す。

【００３８】なお、酸化ガス給排装置から各積層体１２Ａ～１２Ｄに至る燃料等給排部材４０に形成された酸化ガスの供給側の各流路（酸化ガス分配溝７０，酸化ガス供給口７１Ａ～７１Ｄおよび酸化ガス供給通路７３Ａ～７３Ｄ）がそれぞれ同一形状をしており、積層体１２Ａ～１２Ｄから酸化ガス給排装置に至る燃料等給排部材４０に形成された酸化ガス側の排ガスの排出側の各流路（酸化ガス排出通路７５Ａ～７５Ｄ，酸化ガス排出口７６Ａ～７６Ｄおよび酸化ガス排出部７８）もそれぞれ同一形状をしているから、燃料等給排部材４０から各積層体１２Ａ～１２Ｄに酸化ガスが均等に供給され、各積層体１２Ａ～１２Ｄから燃料等給排部材４０へ酸化ガス側の排ガスが均等に排出される。

【００３９】次に上部ケース８０の構造について説明する。図１１は図１に示した上部ケース８０のＥ－Ｅ線断面図、図１２は図１に示した上部ケース８０のＦ－Ｆ線断面図である。上部ケース８０は、鋼板材により形成されており、図１，図１１および図１２に示すように、上部８１と、この上部８１から直角に折り曲がった２つの側部８２とからなる。上部８１には、リブ部８４が打ち抜きにより形成されている。リブ部８４は、図１１に示すように、その両サイドを図中下に折り曲げて形成したガイド部８５を備える。上部８１の打ち抜かれた周囲には、断面が半円形の湾曲部８６が形成されている。湾曲部８６のリブ部８４のガイド部８５に対向する部分には、図１１および図１２に示すように、リブ部８４のガイド部８５と同様なガイド部８７が形成されている。このガイド部８５とガイド部８７は、積層体１２Ａ～１２Ｄを積層する際、単電池１３をガイドする。こうしたリブ部８４，ガイド部８５，湾曲部８６およびガイド部８７により上部ケース８０の剛性が高められている。上部８１および側部８２の燃料等給排部材４０および加圧機構１１０と接続される両端部には、上部ケース８０を燃料等給排部材４０および加圧機構１１０に固定するためのボルト穴が形成されている。

【００４０】次に下部ケース９０の構造について説明する。図１３は図１に示した下部ケース９０のＧ－Ｇ線断面図、図１４は図１に示した下部ケース９０のＨ－Ｈ線断面図である。下部ケース９０は、上部ケース８０と同様に鋼板材により形成されており、図１，図１３および図１４に示すように、底部９１と、この底部９１から直角に折り曲がった２つの側部９２とからなる。図１および図１３に示すように、底部９１の上部ケース８０のリブ部８４に対向する位置には、断面が半円形で図１３中上に凸となるよう湾曲部９４が形成されている。また、底部９１の湾曲部９４に対向する端部と、加圧機構１１０と接続される端部には、湾曲部９４と同一形状の湾曲部９６が形成されている。底部９１の燃料等給排部材４０と接続される端部には、図１４に示すように、湾曲部９４と同一形状で、図１４中下に凸となるよう湾曲部９８が形成されている。湾曲部９４に対向する湾曲部９６と湾曲部９４は、積層体１２Ａ～１２Ｄを積層する際の位置決めに用いられる。また、こうした湾曲部９４，９６，９８により、下部ケース９０の剛性が高めてられている。底部９１および側部９２の燃料等給排部材４０および加圧機構１１０と接続される両端部には、各下部ケース９０を燃料等給排部材４０および加圧機構１１０に固定するためのボルト穴が形成されている。

【００４１】下部ケース９０の側部９２の燃料等給排部材４０に接続される端部付近には、燃料等給排部材４０を挟む積層体の積層端に配置される端子板１００に形成された端子１００Ａを取り出す矩形の端子孔９９が形成されている。この燃料等給排部材４０を挟んで対峙する２つの端子１００Ａは、図１５に示すように結線することができる。図１５に結線の様子を示す。図示するように、端子板１００は、導電材料で矩形の板状に形成されており、その一辺には、突出した端子１００Ａが形成されている。この端子１００Ａは、燃料電池１０を組み付けた際、各下部ケース９０の端子孔９９から突出する。端子１００Ａ間を結線する結線板１０２には、この端子１００Ａに係合可能な係合部１０４が両端に形成されている。この係合部１０４を端子１００Ａに係合させることにより、端子１００Ａ間の結線が行なわれる。実施例の燃料電池１０では、積層体１２Ａと積層体１２Ｃおよび積層体１２Ｂと積層体１２Ｄが結線板１０２により結線されている。

【００４２】また、積層体１２Ｃと積層体１２Ｄは、加圧機構１１０側の積層端でも結線されている。積層体１２Ｃと積層体１２Ｄとの結線の様子を図１６に示す。図示するように、積層体１２Ｃの積層端には、積層体１２Ｄ側に係合凸部１０７が形成された端子板１０６が設置されており、積層体１２Ｄの積層端には、積層体１２Ｃ側に係合凸部１０７と係合可能な係合凹部１０９が形成された端子板１０８が設置されている。この係合凸部１０７と係合凹部１０９は、係合した状態で、端子板１０６（端子板１０８）の厚さ分だけ積層方向にスライドすることができる。したがって、積層体１２Ｃと積層体１

２Ｄとの積層方向の長さが、単電池１３の製造誤差等により若干異なっても、結線することができる。

【００４３】ここで、実施例の燃料電池１０では、積層体１２Ａ～１２Ｄを積層する際、単電池１３を構成する集電極２０を同じ向き（例えば、図２に示すように集電極２０の溝２７が図中右側となる向き）として積層体１２Ａと積層体１２Ｃとを形成し、集電極２０を反対の向き（例えば、図２中の集電極２０を溝２８の中央に位置する溝を軸として１８０度回転させて溝２８が図２中右側となる向き）として積層体１２Ｂと積層体１２Ｄとを形成しているので、結線板１０２により積層体１２Ａと積層体１２Ｃとを結線し、係合凸部１０７と係合凹部１０９とにより積層体１２Ｃと積層体１２Ｄとを結線し、結線板１０２により積層体１２Ｄと積層体１２Ｂとを結線すれば、各積層体１２Ａ～１２Ｄは、積層体１２Ａ，１２Ｃ，１２Ｄ，１２Ｂの順に直列に接続される。したがって、積層体１２Ａおよび積層体１２Ｂの加圧機構１１０側の積層端に、端子板１００を端子板１００に形成された端子１００Ａが図１中上になるよう設置すれば、この端子１００Ａが燃料電池１０の出力端子となり、この端子１００Ａから電力を得ることができる。

【００４４】次に加圧機構１１０について説明する。図１７は、加圧機構１１０の構成を例示する説明図である。図示するように、加圧機構１１０は、加圧機構１１０を上部ケース８０および下部ケース９０に取り付ける取付板１１２と、この取付板１１２に後述する加圧ボルト１４０に作用する加圧に伴う反力を伝達する回転防止部材１２０と、各積層体１２Ａ～１２Ｄに積層方向の圧力を作用させる加圧部材１３０と、加圧部材１３０に押圧力を作用させる加圧ボルト１４０とから構成される。取付板１１２には、２つの正八角形の貫通孔１１４が形成されており、この貫通孔１１４に回転防止部材１２０が嵌合されている。

【００４５】図１８は、回転防止部材１２０を図１７中右側から見た説明図である。図示するように、回転防止部材１２０は、加圧ボルト１４０に作用する加圧に伴う反力を取付板１１２に伝達する円形の台座部１２２と、正八角形で取付板１１２の貫通孔１１４に嵌合可能な嵌合部１２４とからなる。嵌合部１２４の中央には、嵌合部１２４を貫通する貫通孔１２６が形成されており、貫通孔１２６の表面は、後述する加圧ボルト１４０の螺刻部１４４と螺合するよう螺刻されている。なお、図１７に示した回転防止部材１２０は、図１８の回転防止部材１２０のＪ－Ｊ線断面図である。

【００４６】図１９は、加圧部材１３０を図１７中右側から見た説明図である。図示するように、加圧部材１３０は、積層体１２Ａ～１２Ｄの積層端に押圧力を作用させる円板１３２と、この円板１３２の中央に取り付けられる加圧軸１３６と、円板１３２と加圧軸１３６を補強する三角形の加圧リブ１３４とからなる。加圧軸１３６の端部（図１７中の右端部）には、半球形状の加圧凹部１３８が形成されている。

【００４７】加圧ボルト１４０は、図１７に示すように、一方の端部１４２は加圧部材１３０の加圧凹部１３８と整合するよう半球形状に形成されており、他方の端部１４６はその断面が六角形となるよう形成されている。加圧ボルト１４０の端部１４２と端部１４６との間は、回転防止部材１２０の貫通孔１２６に螺合する螺刻部１４４が形成されている。

【００４８】こうして構成された加圧機構１１０は、次のようにして積層体１２Ａ～１２Ｄに積層方向の圧力を作用させる。回転防止部材１２０の貫通孔１２６に螺合した加圧ボルト１４０を回転させると、加圧ボルト１４０は、図１７中の左右方向に移動する。加圧ボルト１４０を回転させて、加圧ボルト１４０を同図中の左方向に移動させると、加圧ボルト１４０の端部１４２が加圧部材１３０の加圧凹部１３８に当接し、加圧部材１３０を左方向に移動させる。このため、積層体１２Ａ～１２Ｄには、加圧部材１３０の円板１３２により積層方向の圧力が加えられる。

【００４９】こうした各構成部材により構成された燃料電池１０の燃料等給排部材４０に、図示しない燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置を接続し、燃料ガス，酸化ガスおよび冷却水を供給すれば、燃料電池１０は、次式に示す電気化学反応を行ない、化学エネルギを直接電気エネルギに変換する。

【００５０】カソード反応（酸素極）：$2H^+ + 2e^- + (1/2)O_2 \rightarrow H_2O$

アノード反応（燃料極）：$H_2 \rightarrow 2H^+ + 2e^-$

【００５１】以上説明した実施例の燃料電池１０によれば、各積層体１２Ａ～１２Ｄへの燃料ガス，酸化ガスおよび冷却水の給排のために、燃料等給排部材４０と燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置とを接続するだけでよく、積層体毎に接続が必要な燃料電池に比して接続箇所および接続配管を少なくすることができる。この結果、燃料電池１０の設置スペースを小さくすることができ、燃料電池１０の設置を容易にすることができる。また、燃料等給排部材４０と４つの積層体１２Ａ～１２Ｄとを一体化して一剛性体とするので、燃料電池１０を車両等に容易に設置することができる。

【００５２】また、燃料等給排部材４０を積層体１２Ａ～１２Ｄで挟持し、燃料等給排部材４０の積層体１２Ａ～１２Ｄの接触面から積層体１２Ａ～１２Ｄへの燃料ガス，酸化ガスおよび冷却水の給排を行ない、積層体１２Ａ～１２Ｄの他端から加圧機構１１０により圧力を加えるので、燃料等給排部材４０と積層体１２Ａ～１２Ｄとの接触面に十分なシール性を確保することができる。この結果、燃料ガス等の漏れを防止することができる。

【００５３】さらに、燃料ガス給排装置および酸化ガス給排装置から各積層体１２Ａ～１２Ｄに至る燃料等給排

部材４０の供給側の各流路をそれぞれの積層体毎に同一形状とすると共に各積層体１２Ａ～１２Ｄから燃料ガス給排装置および酸化ガス給排装置に至る燃料等給排部材４０の排出側の各流路もそれぞれの積層体毎に同一形状としたので、燃料等給排部材４０から各積層体１２Ａ～１２Ｄに燃料ガスおよび酸化ガスを均等に供給することができ、各積層体１２Ａ～１２Ｄから燃料等給排部材４０へ燃料ガス側および酸化ガス側の排ガスを均等に排出することができる。この結果、各積層体１２Ａ～１２Ｄを同じ条件で運転することができ、運転効率の良い燃料電池とすることができる。

【００５４】実施例の燃料電池１０では、上部ケース８０を打ち抜き、リブ部８４とリブ部８４に対向する湾曲部８６とに、それぞれガイド部８５およびガイド部８７を設け、さらに下部ケース９０に湾曲部９４，９６を設けて、積層体１２Ａ～１２Ｄを積層する際に単電池１３の位置が定まるようにしたので、各積層体１２Ａ～１２Ｄを精度良く積層することができる。この結果、内部抵抗の小さな燃料電池とすることができる。また、実施例の燃料電池１０では、上部ケース８０を打ち抜いたので、積層体１２Ａ～１２Ｄの積層状態を確認することができ、容易にメンテナンスすることができる。さらに、実施例の燃料電池１０では、加圧機構１１０による加圧が各積層体１２Ａ～１２Ｄ毎に行なわれるので、積層体１２Ａ～１２Ｄ毎に加える圧力を調節することができ、積層体１２Ａ～１２Ｄ毎にメンテナンスすることができる。

【００５５】なお、実施例の燃料電池１０では、４つの積層体１２Ａ～１２Ｄに挟持され、この４つの積層体１２Ａ～１２Ｄへの燃料ガス等の給排を行なう燃料等給排部材４０を用いたが、例えば、２つの積層体に挟持され２つの積層体への燃料ガス等の給排を行なう燃料等給排部材を用いる構成や、６つの積層体あるいは８つの積層体等の偶数個の積層体により挟持され偶数個の積層体への燃料ガス等の給排を行なう燃料等給排部材を用いる構成も好適である。また、３つ以上の奇数個の積層体で多方向から支持される燃料等給排部材としてもよい。

【００５６】実施例では、燃料ガス供給口５０と燃料ガス排出口５９とを燃料等給排部材４０の対向する面に形成したが、同一面に形成する構成も好適である。また、実施例では、燃料等給排部材４０をアルミニウムにより形成したが、鉄等の他の金属，アルミニウム合金やその他の金属等の合金，エンジニアリングプラスチック等の樹脂等により形成してもよい。さらに、実施例では、単一部材に切削加工を施して燃料ガス供給流路５１等の流路を燃料等給排部材４０の内部に形成したが、予め切削加工を施した２以上の部材を接合して内部に燃料ガス供給流路等の流路を備えた燃料等給排部材を形成してもよい。

【００５７】実施例では、燃料等給排部材４０に、燃料ガスの給排流路，酸化ガスの給排流路および冷却水の給排流路を形成したが、いずれか１つの給排流路あるいはいずれか２つの給排流路を形成する構成としてもよい。例えば、燃料電池の運転条件によっては、冷却水が不要な場合もあり、この場合には、冷却水供給通路４３Ａ～４３Ｄ等の通路を形成しなくてもよい。

【００５８】実施例では、各積層体１２Ａ～１２Ｄを結線板１０２，端子板１０６および端子板１０８により積層体１２Ａ，１２Ｃ，１２Ｄ，１２Ｂの順で電気的に直列に接続したが、各積層体１２Ａ～１２Ｄを電気的に並列に接続してもよく、各積層体１２Ａ～１２Ｄのうちの２つずつを電気的に直列に接続しこの直列に接続した２組を電気的に並列としてもよい。

【００５９】各積層体１２Ａ～１２Ｄを電気的に並列に接続する場合、燃料等給排部材４０を挟んで対峙する積層体の積層端の電気極性は、同じ極性としてもよく、異なる極性としてもよい。この場合、各積層体１２Ａ～１２Ｄの両積層端に端子板１００を設置し、この端子板１００に形成された端子１００Ａを介して各積層体１２Ａ～１２Ｄからそれぞれ電力を取り出してもよい。また、各積層体１２Ａ～１２Ｄの加圧機構１１０側の積層端を接地し、燃料等給排部材４０側の積層端からプラス極またはマイナス極を取り出してもよい。各積層体１２Ａ～１２Ｄの加圧機構１１０側の積層端を接地する場合、各積層体１２Ａ～１２Ｄの加圧機構１１０側の積層端がいずれもマイナス極またはプラス極となるよう各積層体１２Ａ～１２Ｄを積層する。

【００６０】各積層体１２Ａ～１２Ｄのうちの２つずつを電気的に直列に接続し、この直列に接続した２組を電気的に並列に接続する場合、積層体１２Ａと積層体１２Ｃ，積層体１２Ｂと積層体１２Ｄを結線板１０２によりそれぞれ直列に接続してもよく、積層体１２Ａと積層体１２Ｂ，積層体１２Ｃと積層体１２Ｄを端子板１０６と端子板１０８とによりそれぞれ直列に接続してもよい。積層体１２Ａと積層体１２Ｂとを直列に接続する場合、積層体１２Ａと積層体１２Ｂの加圧機構１１０側の積層端を端子板１０６と端子板１０８とにより結線して燃料等給排部材４０側から出力端子を取り出してもよく、燃料等給排部材４０側の積層端を端子板１０６と端子板１０８とにより結線して加圧機構１１０側から出力端子を取り出してもよい。

【００６１】次に実施例の燃料電池１０を自動車２００に搭載した場合の様子について説明する。図２０（ａ）は自動車２００に燃料電池１０等を搭載する際の配置の一例を示した平面図、図２０（ｂ）はこの燃料電池１０等の配置の側面図である。図２０（ａ）に示すように、自動車２００には、燃料電池１０、メタノールと水との混合物を貯蔵しメタノールを改質して燃料電池１０に燃料ガスを供給する燃料タンク２２０、燃料電池１０から排出される燃料ガス側の排ガスを受け入れてメタノール

15

に再生するメタノールリフォーマ２２２、冷却水を燃料電池１０に供給する冷却水タンク２２４、冷却水タンク２２４から水の供給を受けて燃料ガスを加湿する加湿器２２６、燃料電池１０から排出された冷却水を外気との熱交換により冷却するラジエター２２８等が搭載されている。

【００６２】ここで、この自動車２００では、燃料電池１０に接続される燃料ガス給排装置として燃料タンク２２０およびメタノールリフォーマ２２２を搭載し、冷却水給排装置として冷却水タンク２２４およびラジエター２２８を搭載している。また、自動車２００は、酸化ガス給排装置として外気を所定の圧力に加圧して燃料電池１０に供給する図示しないコンプレッサ等を搭載している。この他、自動車２００には、燃料電池１０から出力される直流電圧を３相交流電圧に変換すると共に振幅と周波数を制御するインバータ２１０，２１２やインバータ２１０，２１２からの３相交流電圧によって駆動するモータ２１４等も搭載されている。

【００６３】図２０（ｂ）に示すように、燃料電池１０，加湿器２２６，インバータ２１０，２１２およびモータ２１４は、自動車２００の中央付近に設置された後部座席２４０の下に設置されている。また、ラジエター２２８は、自動車２００の最前部の最下部に設置されている。ここで、燃料電池１０は、一剛性体として組み付けられているので、自動車２００の振動に対して一つの物体としての挙動を示す。燃料電池１０の自動車２００への設置は、燃料等給排部材４０が燃料タンク２２０，メタノールリフォーマ２２２および冷却水タンク２２４に接続配管等により接続されることから、自動車２００の走行時の振動により燃料等給排部材４０が大きく振動しないよう燃料等給排部材４０で燃料電池１０の荷重を支持するよう取り付けられている。

【００６４】以上説明したように、燃料電池１０は、一剛性体として組み付けられているので、自動車２００に容易に搭載することができ、自動車２００の走行時の振動に対しても一物体として考えることができる。また、燃料等給排部材４０で燃料電池１０の荷重を支持するよう取り付けたので、自動車２００の走行時の振動により燃料等給排部材４０が大きく振動することがなく、接続配管や接続に用いられるボルト等に与える応力を小さくすることができる。この結果、接続部に十分なシール性が得られ、燃料ガスや冷却水等の漏れを防止することができる。さらに、積層体１２Ａ～１２Ｄの積層方向を水平方向として燃料電池１０を後部座席２４０の下に設置したので、自動車２００内の居住空間を大きくすることができる。なお、実施例では、燃料電池１０を自動車２００に搭載したが、自動車以外の移動車両に搭載してもよい。また、移動車両に搭載しない構成でも差し支えない。

【００６５】次に、本発明の第２の実施例である燃料電池３１０について説明する。図２１は、第２実施例の燃料電池３１０の概略を例示する説明図である。図示するように、燃料電池３１０は、単電池を積層してなる４つの積層体３１２Ａ～３１２Ｄと、この積層体３１２Ａ～３１２Ｄへの燃料等の給排を行なう燃料等給排部材３４０と、積層体３１２Ａ～３１２Ｄおよび燃料等給排部材３４０を収納する収納容器３８０と、積層体３１２Ａ～３１２Ｄに積層方向の圧力を加える加圧機構１１０とから構成される。なお、第２実施例の加圧機構１１０は、第１実施例の燃料電池１０が備える加圧機構１１０と同一の構成なので、同一の符号を付してその説明を省略する。

16

【００６６】図２２は、積層体３１２Ａ～３１２Ｄとを構成する単電池３１３および冷却部材３３０の構成の概略を例示する斜視図である。単電池３１３は、固体高分子型燃料電池の単電池であり、図示するように、電解質膜３１４と、この電解質膜３１４を両側から挟んでサンドイッチ構造を形成する２つのガス拡散電極３１６と、このサンドイッチ構造を両側から挟持する２つの集電極３２０とから構成される。

【００６７】電解質膜３１４およびガス拡散電極３１６は、第１実施例の電解質膜１４およびガス拡散電極１６と同一の材料（電解質膜３１４については高分子材料、ガス拡散電極３１６についてはカーボンクロス）より形成されており、同一の方法（ホットプレス法）により接合されている。

【００６８】集電極３２０は、第１実施例の集電極２０と同一の材料である緻密質カーボンにより積層面が図２２中左右方向より上下方向の方が若干長い長方形状の薄板に形成されている。この積層面の図中上部右側と下部左側には、集電極３２０の上縁または下縁に沿って細長い貫通孔（冷却水孔３２１，３２２）が形成されている。この冷却水孔３２１，３２２は、積層体を形成した際、積層体を積層方向に貫通する冷却水の流路を形成する。また、この積層面には、断面が直角二等辺三角形の貫通孔（燃料ガス孔３２３，３２４および酸化ガス孔３２５，３２６）が形成されている。この燃料ガス孔３２３，３２４および酸化ガス孔３２５，３２６は、積層体を形成した際、燃料ガスおよび酸化ガスの積層体を積層方向に貫通する流路を形成する。

【００６９】集電極３２０の積層面の一方（図中裏面）には、対角に位置する燃料ガス孔３２３，３２４間を連絡する平行な複数の溝３２７が形成されており、積層面の他方（図中表示面）には、もう一方の対角に位置する酸化ガス孔２５，２６間を連絡する溝３２８が形成されている。この溝３２７と溝３２８とは直交しており、それぞれガス拡散電極３１６の表面とで酸化ガスまたは燃料ガスの流路をなす。なお、電解質膜３１４およびガス拡散電極３１６を挟んで溝３２７と溝３２８とが対峙するよう集電極３２０が配置される。

【００７０】冷却部材３３０も集電極３２０と同様に緻密質カーボンにより形成されている。冷却部材３３０の積層面には、集電極３２０の積層面に形成された冷却水孔３２１，３２２，燃料ガス孔３２３，３２４および酸化ガス孔３２５，３２６と同一の場所に同一形状の冷却水孔３３１，３３２，燃料ガス孔３３３，３３４および酸化ガス孔３３５，３３６が形成されている。冷却水孔３３１，３３２は集電極３２０の冷却水孔３２１，３２２と共に冷却水の流路を形成し、燃料ガス孔３３３，３３４および酸化ガス孔３３５，３３６は、集電極３２０の燃料ガス孔３２３，３２４および酸化ガス孔３２５，３２６と共に燃料ガスおよび酸化ガスの流路を形成する。また、冷却部材３３０の積層面の一方（図中表示面）には、冷却水孔３３１から冷却水孔３３２に至る葛折状の溝３３８がリブ３３７により形成されている。この溝３３８は、溝３２７または溝３２８のいずれかが形成されていない集電極（図示せず）の溝が形成されていない積層面とで冷却水の通路を形成する。

【００７１】こうして構成された単電池３１３と冷却部材３３０を積層して積層体３１２Ａ～３１２Ｄを形成する。第二実施例でも、単電池３１３と冷却部材３３０とを３：１の比率として積層し、積層体３１２Ａ～３１２Ｄを形成した。

【００７２】図２３は、燃料等給排部材３４０の概観を例示する斜視図である。図２４は燃料等給排部材３４０の燃料ガスの供給用流路および排出用流路を例示した説明図、図２５は燃料等給排部材３４０の酸化ガスの供給用流路および排出用流路を例示した説明図、図２６は燃料等給排部材３４０の冷却水の供給用流路および排出用流路を例示した説明図である。

【００７３】燃料等給排部材３４０は、アルミニウムにより直方体形状に形成されている。この燃料等給排部材３４０は、第１実施例の燃料等給排部材４０と同様に、図示しない燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置からの燃料ガス，酸化ガスおよび冷却水を積層体３１２Ａ～３１２Ｄに供給すると共に、積層体３１２Ａ～３１２Ｄから排出される燃料ガス側の排ガス，酸化ガス側の排ガスおよび冷却水を燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置に戻す部材である。このため、燃料等給排部材３４０には、以下に説明する燃料ガス給排装置と各積層体３１２Ａ～３１２Ｄとを連絡する燃料ガスの給排のための流路，酸化ガス給排装置と各積層体３１２Ａ～３１２Ｄとを連絡する酸化ガスの給排のための流路および冷却水給排装置と各積層体３１２Ａ～３１２Ｄとを連絡する冷却水の給排のための流路が形成されている。

【００７４】燃料等給排部材３４０には、図２３ないし図２６に示すように、２つの集電極３２０を冷却水孔３２１が燃料等給排部材３４０の上方両側となるよう並べて燃料等給排部材３４０に整合させた際、２つの集電極３２０の積層面に形成された冷却水孔３２１，３２２，燃料ガス孔３２３，３２４および酸化ガス孔３２５，３２６と整合する冷却水孔３６４Ａ，３６４Ｂ，３６６Ａ，３６６Ｂ，燃料ガス孔３４４Ａ，３４４Ｂ，３４６Ａ，３４６Ｂおよび酸化ガス孔３５４Ａ，３５４Ｂ，３５６Ａ，３５６Ｂが形成されている。また、燃料等給排部材３４０の図２３中上面には、図示しない燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置に接続されて燃料ガス，酸化ガスおよび冷却水の供給を受ける供給孔３４１，３５１，３６１が形成されており、図２３中下面（裏面）には、図２４ないし図２６に示すように、燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置に接続され燃料ガス系の排ガス，酸化ガス系の排ガスおよび冷却水を燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置に排出する排出孔３４９，３５９，３６９が形成されている。

【００７５】図２４に示すように、供給孔３４１は、燃料ガス供給流路３４２Ａおよび３４２Ｂにより燃料ガス孔３４４Ａおよび３４４Ｂと連絡しており、排出孔３４９は、燃料ガス排出流路３４７により燃料ガス孔３４６Ａおよび３４６Ｂと連絡している。したがって、燃料等給排部材３４０は、燃料ガス給排装置からの燃料ガスを供給孔３４１，燃料ガス供給流路３４２Ａおよび３４２Ｂ，燃料ガス孔３４４Ａおよび３４４Ｂを介して積層体３１２Ａ～３１２Ｄに供給すると共に、積層体３１２Ａ～３１２Ｄから排出される燃料ガス系の排ガスを燃料ガス孔３４６Ａおよび３４６Ｂ，燃料ガス排出流路３４７，排出孔３４９を介して燃料ガス給排装置に排出する。

【００７６】また、図２５に示すように、燃料等給排部材３４０の供給孔３５１は、酸化ガス供給流路３５２により酸化ガス孔３５４Ａおよび３５４Ｂと連絡しており、排出孔３５９は、酸化ガス排出流路３５７Ａおよび３５７Ｂにより酸化ガス孔３５６Ａおよび３５６Ｂと連絡している。したがって、燃料等給排部材３４０は、酸化ガス給排装置からの酸化ガスを供給孔３５１，酸化ガス供給流路３５２，酸化ガス孔３５４Ａおよび３５４Ｂを介して積層体３１２Ａ～３１２Ｄに供給すると共に、積層体３１２Ａ～３１２Ｄから排出される酸化ガス系の排ガスを酸化ガス孔３５６Ａおよび３５６Ｂ，酸化ガス排出流路３５７Ａおよび３５７Ｂ，排出孔３５９を介して酸化ガス給排装置に排出する。

【００７７】図２６に示すように、燃料等給排部材３４０の供給孔３６１は、冷却水供給流路３６２Ａおよび３６２Ｂにより冷却水孔３６４Ａおよび３６４Ｂと連絡しており、排出孔３６９は、冷却水排出流路３６７Ａおよび３６７Ｂにより冷却水孔３６６Ａおよび３６６Ｂと連絡している。したがって、燃料等給排部材３４０は、冷却水給排装置からの冷却水を供給孔３６１，冷却水供給流路３６２Ａおよび３６２Ｂ，冷却水孔３６４Ａおよび

３６４Ｂを介して積層体３１２Ａ～３１２Ｄに供給すると共に、積層体３１２Ａ～３１２Ｄから排出される冷却水を冷却水孔３６６Ａおよび３６６Ｂ，冷却水排出流路３６７Ａおよび３６７Ｂ，排出孔３６９を介して冷却水給排装置に排出する。

【００７８】こうして構成された燃料等給排部材３４０は、前後および左右が対称に形成されているから積層体３１２Ａ～３１２Ｄに燃料ガス，酸化ガスおよび冷却水を均等に供給することができる。

【００７９】次に、こうした燃料等給排部材３４０および積層体３１２Ａ～３１２Ｄを収納する収納容器３８０について説明する。図２７は、図２１に示す燃料電池３１０をＪ－Ｊ断面で切断した断面図である。図２１および図２７に示すように、収納容器３８０は、矩形の箱状をしており、上蓋３８１と、積層体３１２Ａ～３１２Ｄを収納する収納部３９１と、収納部３９１の両端に取り付けられる加圧機構１１０とにより構成されている。

【００８０】収納部３９１の下部中央内側には、積層体３１２Ａ等の積層方向に沿ったリブ３９２が折り曲げ形成されている。このリブ３９２は、燃料等給排部材３４０が取り付けられる位置に相当する部分は切り取られている。また、収納部３９１の積層体３１２Ａ等の積層面に沿った各面には、積層体３１２Ａ等の積層方向に沿った平行な２つの支持部３９４Ａ，３９４Ｂ等が形成されており、リブ３９２にも同様な支持部３９４Ａ，３９４Ｂが形成されている。この支持部３９４Ａ，３９４Ｂの積層体３１２Ａ等の接触側には、積層体３１２Ａ等の積層方向に沿った面と接触した状態で移動させた際に絶縁性で摩擦抵抗の小さな材質または絶縁性で摩擦抵抗の小さくなる処理を施したもの（例えば、硬めのフッ素ゴムや天然ゴム，スチレンゴム，ブチルゴム，エチレンゴム，エチレンプロピレンゴム，ハイパロン，シリコンゴム等およびその表面に例えばフッ素系グリス等を塗布したもの等）により形成された摩擦抵抗低減部材３９８が取り付けられている。また、収納部３９１の上部には、上蓋３８１を取り付けるフランジ３９６が形成されている。

【００８１】上部８１の中央内側にも、積層体３１２Ａ等の積層方向に沿ったリブ３８２が折り曲げ形成されている。このリブ３８２も燃料等給排部材３４０が取り付けられる位置に相当する部分は切り取られている。また、上蓋３８１の積層体３１２Ａ等の積層面に沿った面にも、積層体３１２Ａ等の積層方向に沿った平行な２つの支持部３８４Ａ，３８４Ｂ等が形成されており、この支持部３８４Ａ，３８４Ｂの積層体３１２Ａ等の接触側には摩擦抵抗低減部材３９８が取り付けられている。上蓋３８１の縁部には、収納部３９１のフランジ３９６と整合するフランジ３８６が形成されており、図示しないボルトにより収納部３９１に取り付け可能となっている。

【００８２】なお、この収納容器３８０の長手方向の両端には、それぞれ加圧機構１１０が取り付けられ、加圧機構１１０により収納容器３８０に収納した積層体３１２Ａ～３１２Ｄを積層方向に加圧可能となっている。

【００８３】次に収納容器３８０に積層体３１２Ａ等を積層する様子について図２８に基づき説明する。図２８は、収納容器３８０の収納部３９１に積層体３１２Ａ等を積層する様子を説明する説明図である。まず、収納部３９１の中央に燃料等給排部材３４０を設置し、図２８（ａ）に示すように、収納部３９１を水平から若干傾ける。こうした状態で、燃料等給排部材３４０の斜め上方に単電池３１３および冷却部材３０を積層する。このとき、収納部３９１の支持部３９４Ａ，３９４Ｂが単電池３１３等をガイドするから単電池３１３等は容易に位置決めがなされる。また、支持部３９４Ａ，３９４Ｂには摩擦抵抗低減部材３９８が取り付けてあるから、隣接する単電池３１３間に隙間を生じることなく整然と積層することができる。

【００８４】こうして、燃料等給排部材３４０の斜め上方に所定数の単電池３１３を積層したら、収納部３９１の積層体を形成した方の端部に加圧機構１１０を取り付け、僅かに積層体を加圧して仮止めを行なう。形成された積層体は収納部３９１と摩擦抵抗低減部材３９８を介して支持されているから、加圧機構１１０による仮止めもスムースに行なわれる。

【００８５】次に、図２８（ｂ）に示すように、収納部３９１を積層体を形成した方が斜め下方になるよう傾け、燃料等給排部材３４０の斜め上方に単電池３１３等を同様に積層する。そして、その積層端側に加圧機構１１０を取り付け、僅かに加圧して仮止めする。

【００８６】続いて、燃料等給排部材３４０の両側に形成された積層体３１２Ａ～３１２Ｄを加圧機構１１０により積層した単電池３１３が所定の面圧になるよう加圧する。この加圧の最中は、燃料等給排部材３４０の両側の積層体３１２Ａ～３１２Ｄに加わる圧力がなるべく均等になるように加圧する。積層体３１２Ａ～３１２Ｄは収納部３９１と摩擦抵抗低減部材３９８を介して支持されているから、スムースに加圧され、積層体内の各単電池３１３に作用する面圧も均一になる。次に、収納部３９１に上蓋３８１を取り付け燃料電池３１０を完成する。

【００８７】こうした各構成部材により構成された燃料電池３１０の燃料等給排部材３４０に、図示しない燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置を接続し、燃料ガス，酸化ガスおよび冷却水を供給すれば、燃料電池３１０は、前述した電気化学反応を行ない、化学エネルギを直接電気エネルギに変換する。

【００８８】以上説明した第２実施例の燃料電池３１０によれば、収納部３９１の積層体３１２Ａ～３１２Ｄの支持部３９４Ａ，３９４Ｂに摩擦抵抗低減部材３９８を

設置したので、収納部３９１へ容易に高精度に積層体を組み付けることができる。また、積層体３１２Ａ～３１２Ｄに所定の圧力を加えた際、積層体３１２Ａ～３１２Ｄがスムースに加圧されて積層体３１２Ａ～３１２Ｄを形成する各単電池３１３は均一な面圧となるから、バラツキのより小さな高精度の燃料電池３１０とすることができる。さらに、一体形成された収納部３９１の中央部に燃料等給排部材３４０を設置したので、加圧機構１１０による引張り圧力は収納部３９１が受け持ち、燃料等給排部材３４０を収納部３９１に固定する必要がない。

【００８９】もとより、各積層体３１２Ａ～３１２Ｄへの燃料ガス，酸化ガスおよび冷却水の給排のために、燃料等給排部材３４０と燃料ガス給排装置，酸化ガス給排装置および冷却水給排装置とを接続するだけでよく、積層体毎に接続が必要な燃料電池に比して接続箇所および接続配管を少なくすることができ、燃料電池３１０の設置スペースを小さくすることができる。また、燃料等給排部材３４０と４つの積層体３１２Ａ～３１２Ｄとを一体化して一剛性体とするので、燃料電池３１０を車両等に容易に設置することができる。燃料等給排部材３４０を積層体３１２Ａ～３１２Ｄで挟持し、他端から加圧機構１１０により圧力を加えるので、燃料等給排部材３４０と積層体３１２Ａ～３１２Ｄとの接触面に十分なシール性を確保することができる。さらに、燃料等給排部材３４０から各積層体３１２Ａ～３１２Ｄに燃料ガス等を均等に供給すると共に各積層体３１２Ａ～３１２Ｄから燃料等給排部材３４０へ燃料ガス系の排ガス等を均等に排出することができるから各積層体３１２Ａ～３１２Ｄを同じ条件で運転することができ、運転効率の良い燃料電池とすることができる。

【００９０】第２実施例の燃料電池３１０では、収納部３９１の支持部３９４Ａ，３９４Ｂに摩擦抵抗低減部材３９８を設置したが、支持部３９４Ａ，３９４Ｂを摩擦抵抗低減部材で形成してもよい。

【００９１】第２実施例の燃料電池３１０では、燃料等給排部材３４０には燃料ガス等の給排に必要な孔等のみを形成したが、図２９に例示する燃料等給排部材３４０Ｂのように、燃料等給排部材を軽量化するために積層体３１２Ａ～３１２Ｄと接触する部分の接触面中央に孔３７１Ａ，３７１Ｂおよび孔３７２Ａ～３７８Ａ，３７２Ｂ～３７８Ｂを形成する構成も好適である。なお、軽量化のための孔の形状は図２９に例示した孔３７１Ａ，３７２Ａ等に限られるものでないことは勿論である。

【００９２】第２実施例の燃料電池３１０では、燃料等給排部材３４０をアルミニウムにより形成したが、鉄等の他の金属や各種の合金、フェノール樹脂やメラミン樹脂，不飽和ポリエステル樹脂，エポキシ樹脂，ケイ素樹脂等の熱硬化性プラスチック、フッ素樹脂や四フッ化エチレン樹脂，ポリカーボネート，ポリフェニレンサルファイド，ポリフェニレンエーテル等の熱可塑性プラスチックなどにより形成してもよい。燃料等給排部材３４０を樹脂等で形成すれば、燃料等給排部材３４０が絶縁するから、積層体３１２Ａ～３１２Ｄの燃料等給排部材３４０側には絶縁板をもうける必要がない。

【００９３】第２実施例の燃料電池３１０では、一体形成された収納部３９１の中央部に燃料等給排部材３４０を設置したが、第１実施例の燃料電池１０のように分離した上部ケース８０および下部ケース９０を燃料等給排部材３４０に取り付ける構成としてもよい。この場合、図３０に示す燃料等給排部材３４０Ｃのように、燃料等給排部材をアルミニウムにより形成された部材４４２とこれを挟持する樹脂により形成された部材４４４，４４６とを接合して形成し、上部ケース８０および下部ケース９０を部材４４２に取り付けるものとすれば、上部ケース８０および下部ケース９０を樹脂に取り付ける場合より大きな強度を得ることができると共に積層体３１２Ａ～３１２Ｄとの絶縁性をも兼ね備えることができる。

【００９４】以上本発明の実施例について説明したが、本発明はこうした実施例に何等限定されるものではなく、本発明の要旨を逸脱しない範囲内において、種々なる態様で実施し得ることは勿論である。

【００９５】

【発明の効果】以上説明したように本発明の燃料電池によれば、複数の積層体で挟持された燃料給排部材が、この複数の積層体との接触部に設けられた孔から複数の積層体に燃料系の給排を行なうので、燃料給排部材に燃料系の給排を行なう燃料給排装置と燃料給排部材とを接続するだけでよく、積層体毎に燃料給排装置との接続を行なう必要がない。このため、接続配管などの接続部品を少なくすることができ、容易に取り付けることができる。

【００９６】請求項２記載の燃料電池によれば、燃料給排部材により積層体の積層方向の燃料系の給排流路を用いて積層体の燃料系の給排を行なうことができ、燃料電池を小型にすることができる。

【００９７】請求項３記載の燃料電池によれば、燃料給排部材と積層体とを一剛性体として固定するので、燃料電池を一物体として取り扱うことができる。したがって、燃料電池を自動車などの移動車両に搭載する場合、その挙動も一物体として考慮するだけでよく、取り付けも積層体毎に行なう必要がない。

【００９８】請求項４記載の燃料電池によれば、燃料給排部材が複数の積層体に挟持されているので、加圧手段により積層体を積層方向に加圧しても、積層体の積層端付近が加圧手段による圧力で膨らんだり反ったりすることがない。また、加圧手段により積層体を積層方向に加圧するので、燃料給排部材と積層体との間のシール性を高くすることができ、燃料等の漏れを防止することができる。さらに、積層体毎に加圧するので、積層体毎に加える圧力を調節することができ、積層体毎にメンテナン

スすることができる。

【００９９】請求項５記載の燃料電池によれば、燃料給排部材を挟んで対峙する積層体の積層端の電気極性を異なるものとしたので、燃料電池を挟んで対峙する積層体を容易に電気的に直列に接続することができる。

【０１００】請求項６記載の燃料電池によれば、積層体の固定部材との接触面または固定部材の積層体との接触面の少なくとも一部に形成された摩擦抵抗低減手段により、積層体を固定部材と接触した状態で移動させる際、積層体の接触部または固定部材の接触部に働く摩擦抵抗が小さくなるから、固定部材への積層体の取り付けをスムースにすることができ、より精密に積層体を組み付けることができる。また、加圧手段を備える場合には、積層体を固定部材と接触した状態で移動させる際の摩擦抵抗が小さいから、積層体をより均等に加圧することができ、燃料電池の性能をより向上させることができる。

【図面の簡単な説明】

【図１】本発明の一実施例である燃料電池１０の概略を例示する説明図である。

【図２】積層体１２Ａ～１２Ｄを構成する単電池１３と冷却部材３０の概略を例示する斜視図である。

【図３】燃料等給排部材４０の概観を例示する斜視図である。

【図４】燃料等給排部材４０の燃料ガスの供給用流路を例示する説明図である。

【図５】燃料等給排部材４０の燃料ガスの排出用流路を例示する説明図である。

【図６】燃料等給排部材４０の酸化ガスの供給用流路および排出用流路を例示する説明図である。

【図７】図３に示した燃料等給排部材４０のＡ－Ａ線断面図である。

【図８】図３に示した燃料等給排部材４０のＢ－Ｂ線断面図である。

【図９】図３に示した燃料等給排部材４０のＣ－Ｃ線断面図である。

【図１０】図３に示した燃料等給排部材４０のＤ－Ｄ線断面図である。

【図１１】図１に示した上部ケース８０のＥ－Ｅ線断面図である。

【図１２】図１に示した上部ケース８０のＦ－Ｆ線断面図である。

【図１３】図１に示した下部ケース９０のＧ－Ｇ線断面図である。

【図１４】図１に示した下部ケース９０のＨ－Ｈ線断面図である。

【図１５】積層体１２Ａと積層体１２Ｃとを結線する様子を例示する説明図である。

【図１６】積層体１２Ｃと積層体１２Ｄとを結線する様子を例示する説明図である。

【図１７】加圧機構１１０の構成を例示する説明図である。

【図１８】回転防止部材１２０の概略を例示する説明図である。

【図１９】加圧部材１３０の概略を例示する説明図である。

【図２０】自動車２００に燃料電池１０等を搭載する際の配置の一例を示す説明図である。

【図２１】第２実施例の燃料電池３１０の概略を例示する説明図である。

【図２２】積層体３１２Ａ～３１２Ｄを構成する単電池３１３と冷却部材３３０の概略を例示する斜視図である。

【図２３】第２実施例の燃料等給排部材３４０の概観を例示する斜視図である。

【図２４】燃料等給排部材３４０の燃料ガスの供給用流路および排出用流路を例示する説明図である。

【図２５】燃料等給排部材３４０の酸化ガスの供給用流路および排出用流路を例示する説明図である。

【図２６】燃料等給排部材３４０の冷却水の供給用流路および排出用流路を例示する説明図である。

【図２７】図２１に示す燃料電池３１０のＪ－Ｊ線断面図である。

【図２８】収納容器３８０の収納部３９１に積層体３１２Ａ等を積層する様子を説明する説明図である。

【図２９】第２実施例の燃料等給排部材３４０の変形例である燃料等給排部材３４０Ｂの概略を例示する説明図である。

【図３０】第２実施例の燃料等給排部材３４０の変形例である燃料等給排部材３４０Ｃの概観を例示する斜視図である。

【符号の説明】

１０…燃料電池
１２Ａ～１２Ｄ…積層体
１３…単電池
１４…電解質膜
１６…ガス拡散電極
２０…集電極
２１，２２…冷却水孔
２３，２４…燃料ガス孔
２５，２６…酸化ガス孔
２７，２８…溝
３０…冷却部材
３１，３２…冷却水孔
３３，３４…燃料ガス孔
３５，３６…酸化ガス孔
３７…リブ
３８…溝
４０…燃料等給排部材
４２Ａ～４２Ｄ…冷却水供給口
４３Ａ～４３Ｄ…冷却水供給通路

４４Ａ～４４Ｄ…冷却水供給接続口
４６Ａ～４６Ｄ…冷却水排出口
４７Ａ～４７Ｄ…冷却水排出通路
４８Ａ～４８Ｄ…冷却水排出接続口
５０…燃料ガス供給口
５１…燃料ガス供給流路
５２…燃料ガス連絡流路
５２Ａ…燃料ガス流路形成部材
５３…切削孔
５４…燃料ガス分配室
５４Ａ…燃料ガス分配室形成部材
５６…切削孔
５７…燃料ガス排出流路
５７Ａ…燃料ガス排出流路形成部材
５８…燃料ガス排出連絡流路
５９…燃料ガス排出口
６２Ａ～６２Ｄ…燃料ガス供給接続口
６３Ａ～６３Ｄ…燃料ガス供給通路
６４Ａ～６４Ｄ…燃料ガス排出接続口
６５Ａ～６５Ｄ…燃料ガス排出通路
７０…酸化ガス分配溝
７１Ａ～７１Ｄ…酸化ガス供給口
７２Ａ～７２Ｄ…酸化ガス供給接続口
７３Ａ～７３Ｄ…酸化ガス供給通路
７４Ａ～７４Ｄ…酸化ガス排出接続口
７５Ａ～７５Ｄ…酸化ガス排出通路
７６Ａ～７６Ｄ…酸化ガス排出口
７８…酸化ガス排出部
８０…上部ケース
８１…上部
８２…側部
８４…リブ部
８５…ガイド部
８６…湾曲部
８７…ガイド部
９０…下部ケース
９１…底部
９２…側部
９４，９６，９８…湾曲部
９９…端子孔
１００…端子
１０２…結線板
１０４…係合部
１０６…端子板
１０７…係合凸部
１０８…端子板
１０９…係合凹部
１１０…加圧機構
１１２…取付板
１１４…貫通孔

１２０…回転防止部材
１２２…台座部
１２４…嵌合部
１２６…貫通孔
１３０…加圧部材
１３２…円板
１３４…加圧リブ
１３６…加圧軸
１３８…加圧凹部
１４０…加圧ボルト
１４２…端部
１４４…螺刻部
１４６…端部
２００…自動車
２１０，２１２…インバータ
２１４…モータ
２２０…燃料タンク
２２２…メタノールリフォーマ
２２４…冷却水タンク
２２６…加湿器
２２８…ラジエター
２４０…後部座席
３１０…燃料電池
３１２Ａ～３１２Ｄ…積層体
３１３…単電池
３１４…電解質膜
３１６…ガス拡散電極
３２０…集電極
３２１，３２２…冷却水孔
３２３，３２４…燃料ガス孔
３２５，３２６…酸化ガス孔
３２７，３２８…溝
３３０…冷却部材
３３１，３３２…冷却水孔
３３３，３３４…燃料ガス孔
３３５，３３６…酸化ガス孔
３３７…リブ
３３８…溝
３４０…燃料等給排部材
３４０Ｂ…燃料等給排部材
３４０Ｃ…燃料等給排部材
３４１，３５１，３６１…供給孔
３４２Ａ，３４２Ｂ…燃料ガス供給流路
３４４Ａ，３４４Ｂ，３４６Ａ，３４６Ｂ…燃料ガス孔
３４７…燃料ガス排出流路
３４９，３５９，３６９…排出孔
３５２…酸化ガス供給流路
３５４Ａ，３５４Ｂ，３５６Ａ，３５６Ｂ…酸化ガス孔
３５７Ａ，３５７Ｂ…酸化ガス排出流路
３６２Ａ，３６２Ｂ…冷却水供給流路

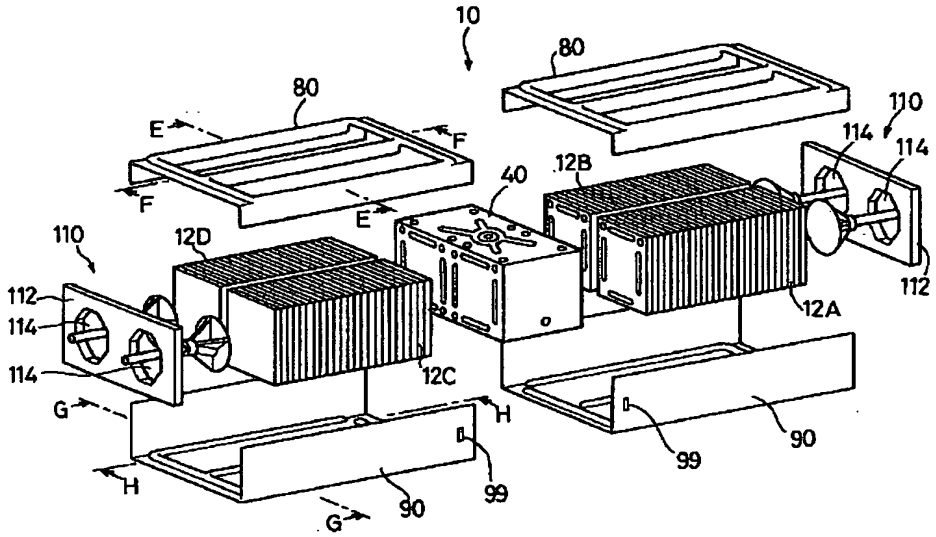
27

３６４Ａ，３６４Ｂ，３６６Ａ，３６６Ｂ…冷却水孔
３６７Ａ，３６７Ｂ…冷却水排出流路
３７１Ａ，３７１Ｂ…孔
３７２Ａ～３７８Ａ，３７２Ｂ～３７８Ｂ…孔
３８０…収納容器
３８１…上蓋
３８２…リブ
３８４Ａ，３８４Ｂ…支持部

28

３８６…フランジ
３９１…収納部
３９２…リブ
３９４Ａ，３９４Ｂ…支持部
３９６…フランジ
３９８…摩擦抵抗低減部材
４４２…部材
４４４，４４６…部材

【図１】



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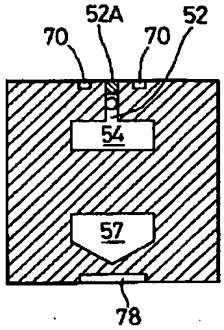

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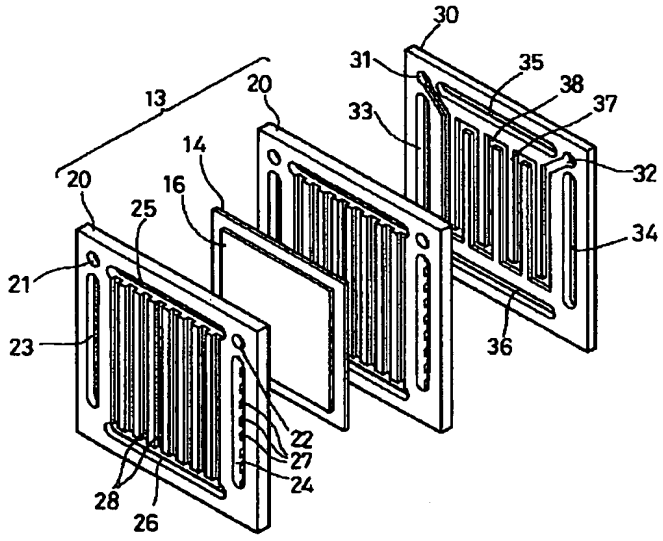

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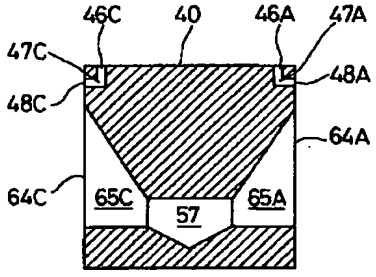

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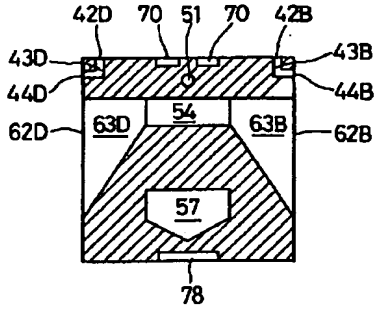

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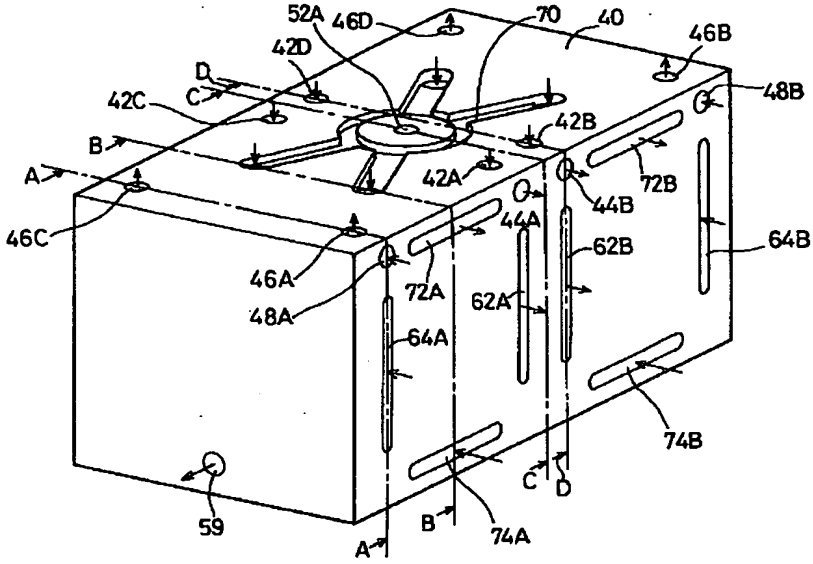

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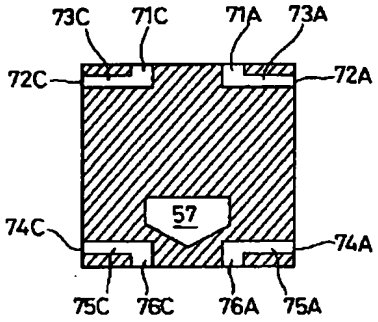

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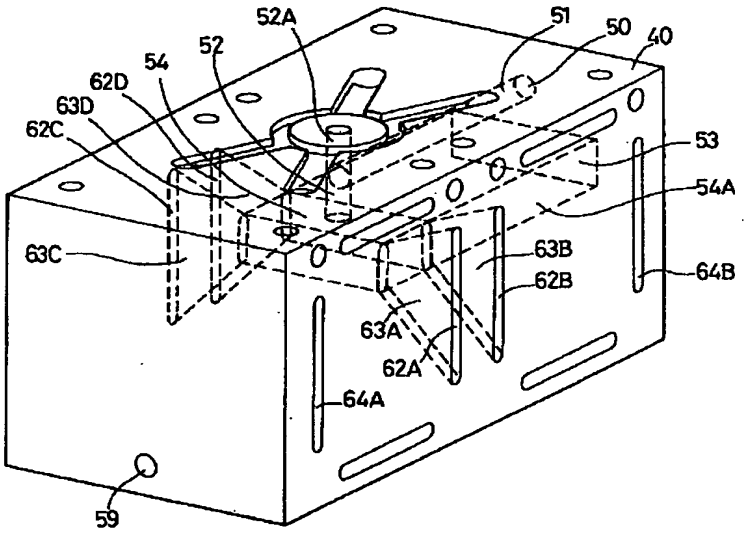

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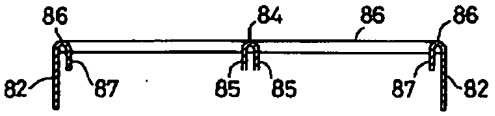

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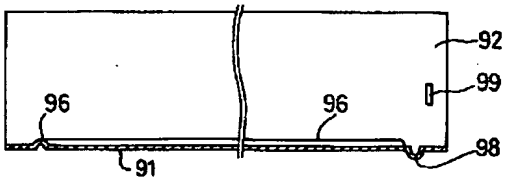

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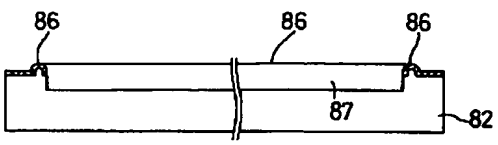

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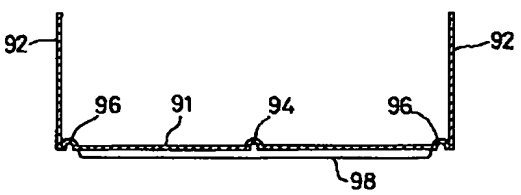

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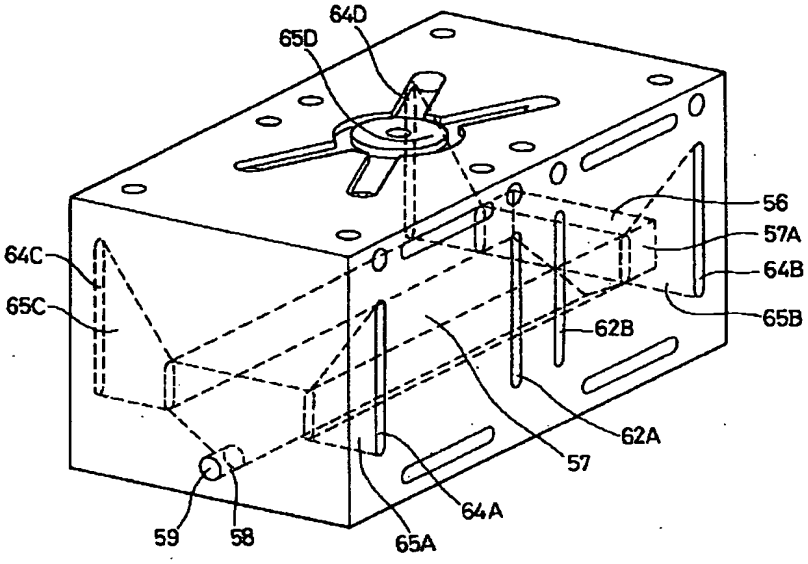

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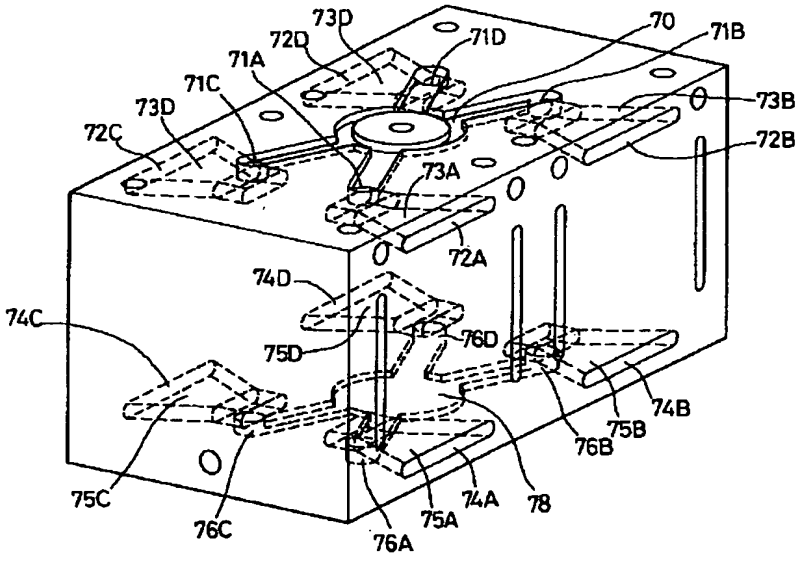

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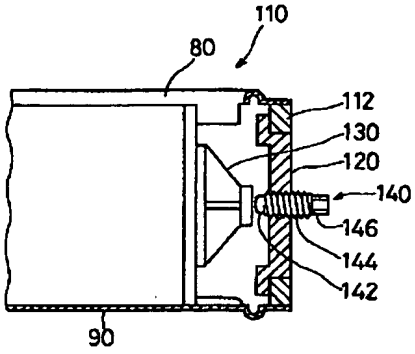

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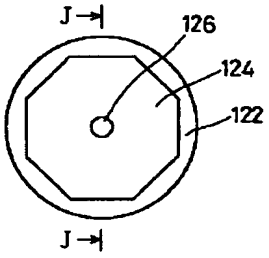

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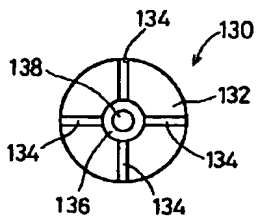

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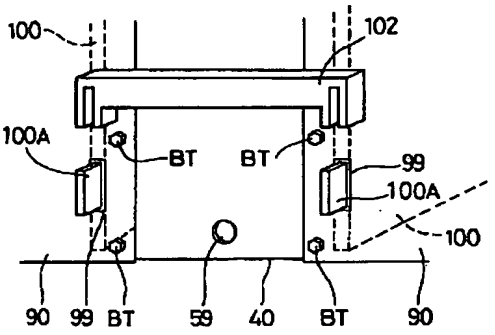

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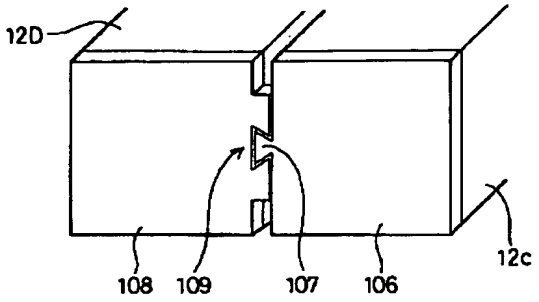

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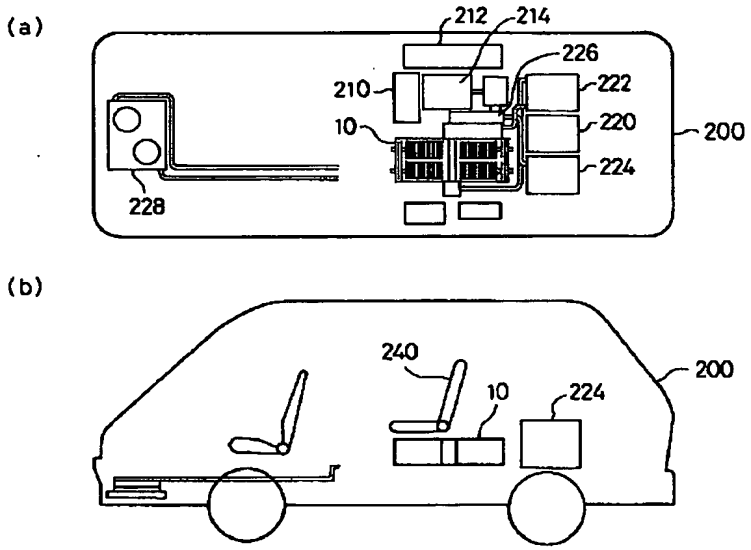

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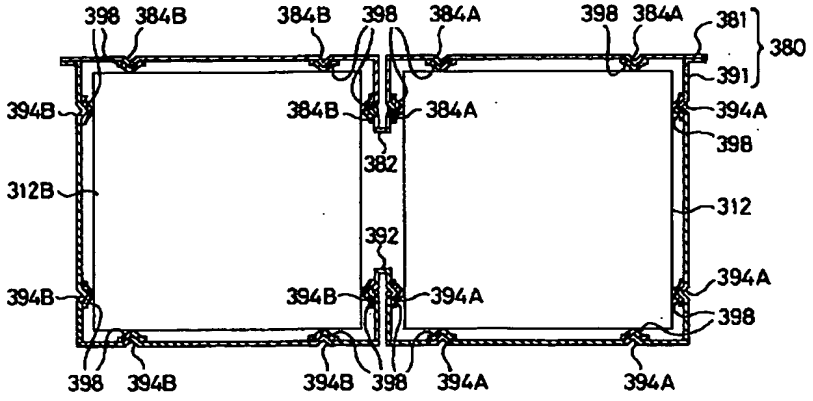

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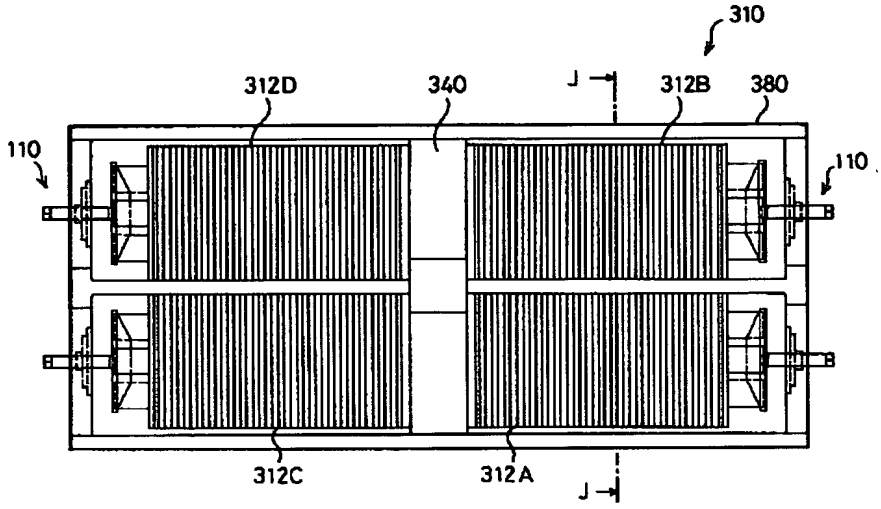
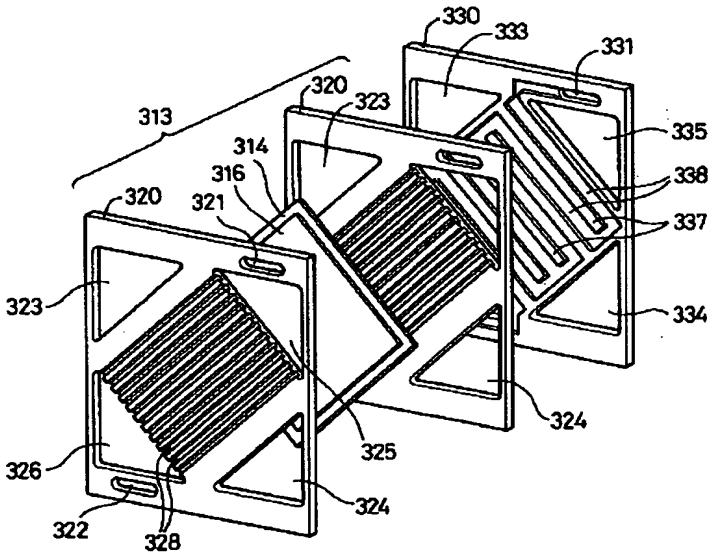

310
312D
340
J
312B
380
110
110
312C
312A
J

【図２２】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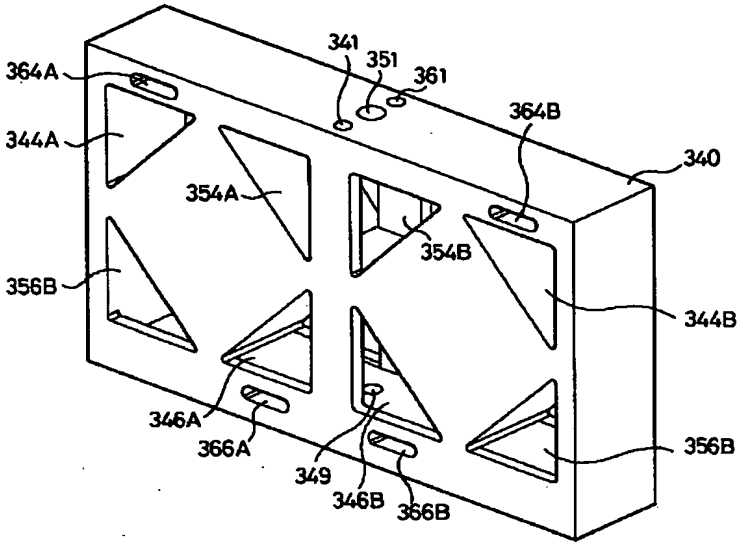
【図２３】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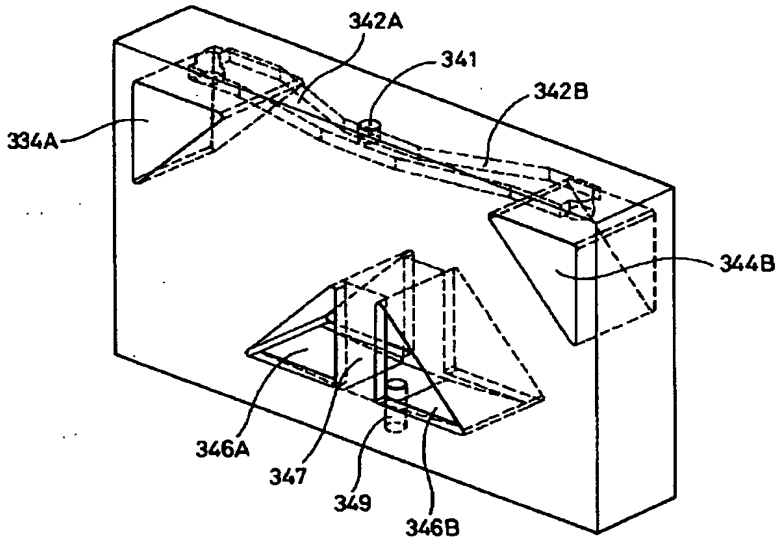
356B
344B
346A
366A
349
346B
366B
356B

【図２４】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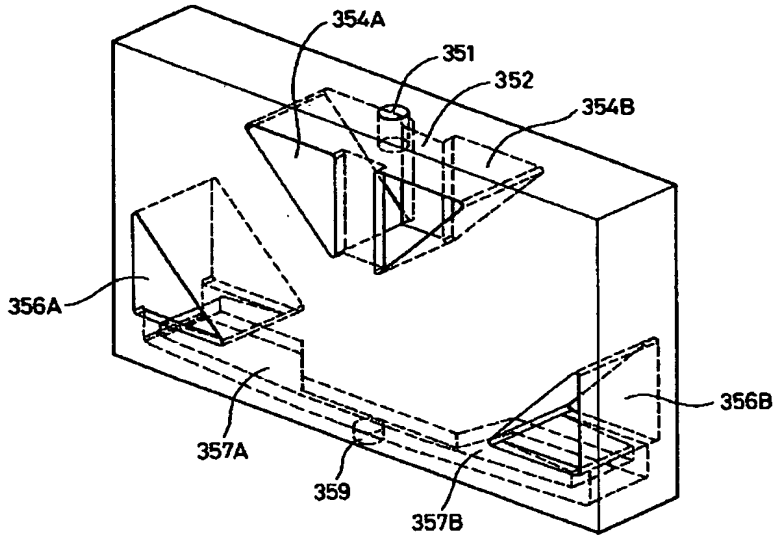
347
349
346B

【図２５】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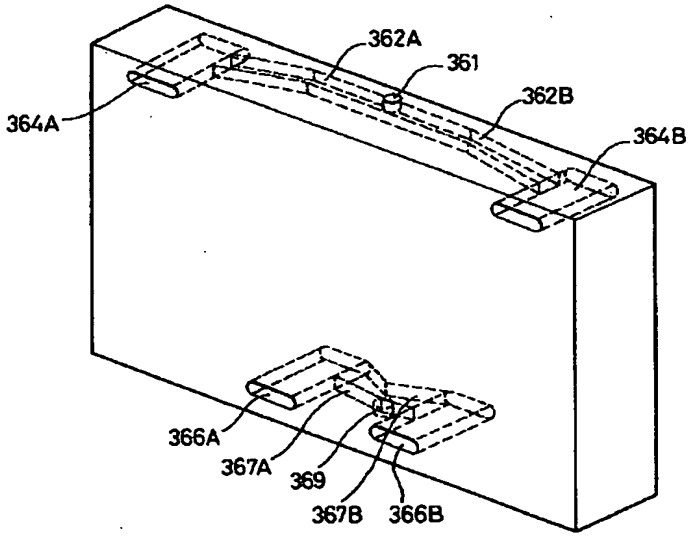
357A
359
357B

【図２６】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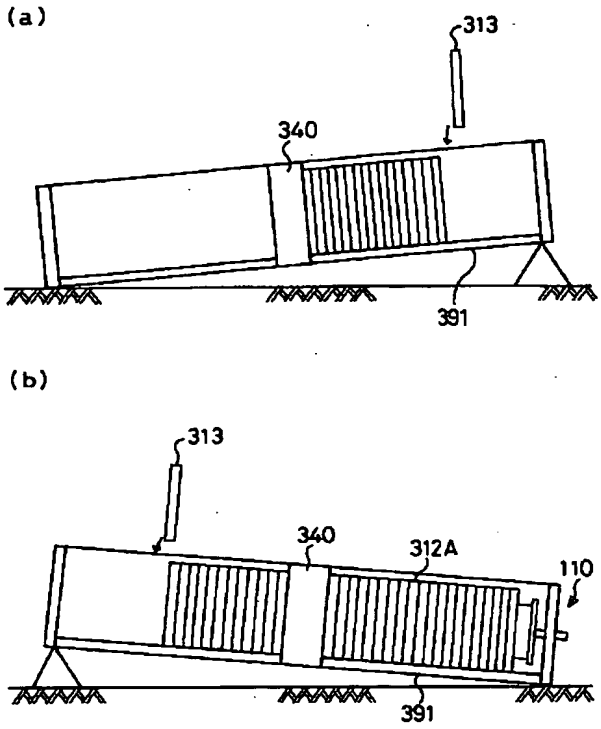
366A
367A
369
367B
366B

【図２８】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(b)
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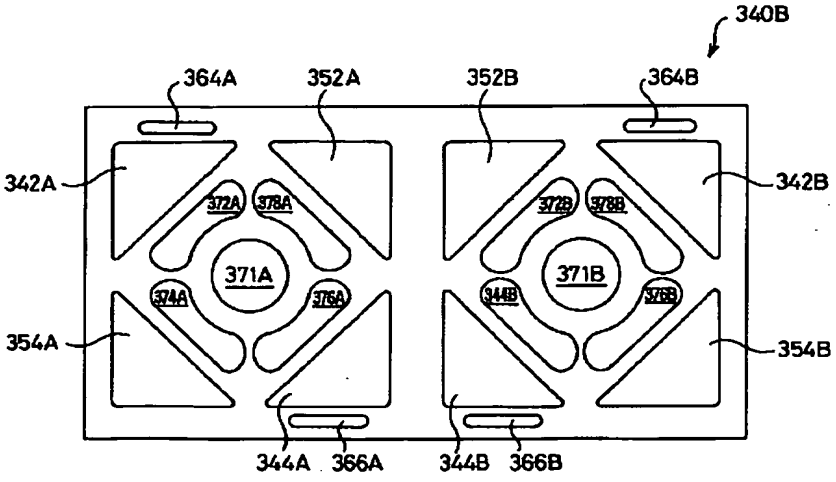
391

【図２９】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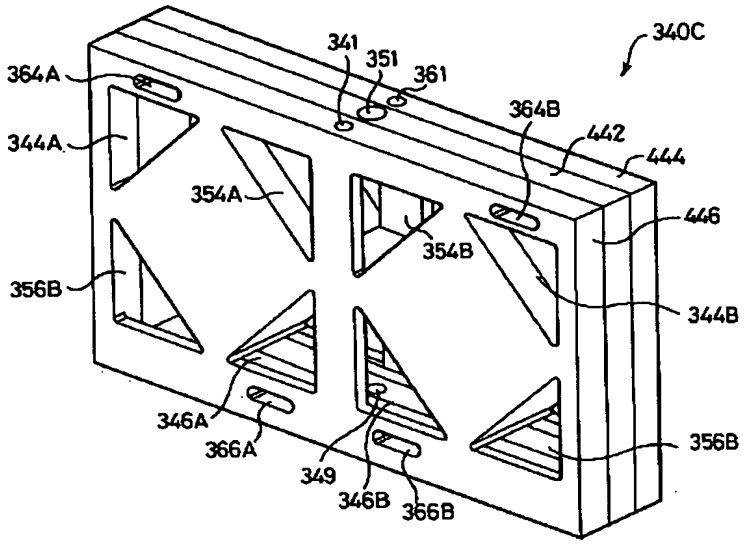
【図３０】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346B
366B
356B

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